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I. OCTOBER 1910 No. 1
Published Monthly by
THE AGRICULTURAL CLUB
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U. T. FARMER

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Vol. V. OCTOBER 1910 No. 1

Published Monthly by

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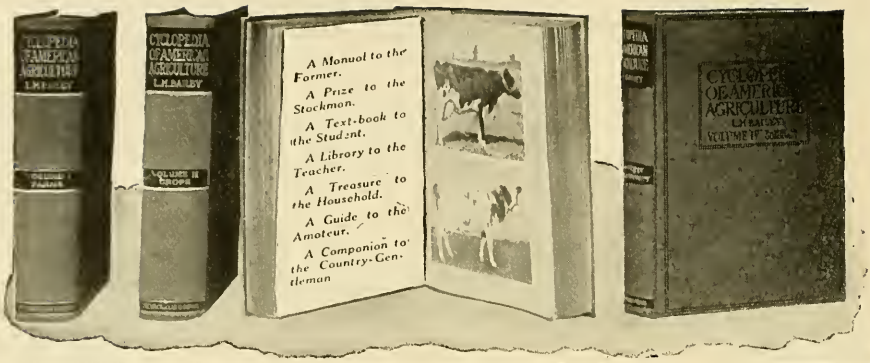

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PROF. C. A. WILLSON

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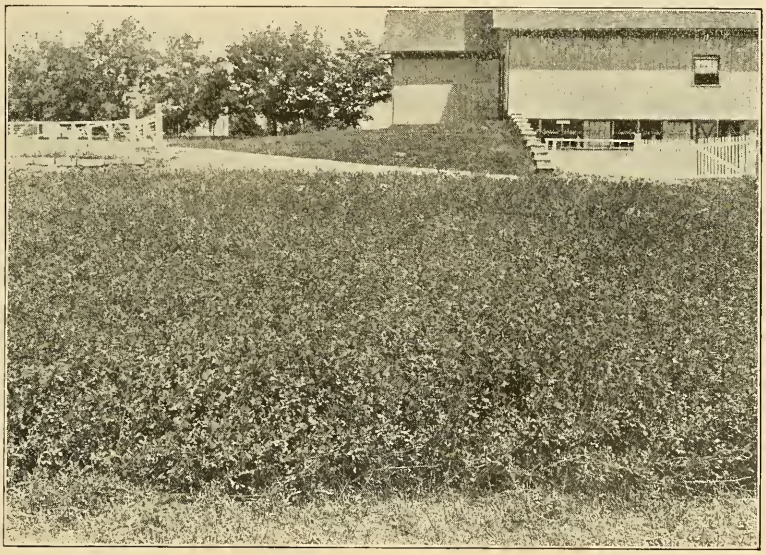
THE U. T. FARMER

Vol. 5. OCTOBER, 1910 No. 1

ALFALFA OF THE UNIVERSITY STATION FARM.

It is believed by farmers that alfalfa can not be grown successfully in Tennessee. Here is the experience of the Experiment Station with this crop:

Section four is a field low in fertility, with a gradual slope to the east. The soil is of the clay loam type, with a clay subsoil, and can be worked into good physical condition. In the fall of 1908, the field was plowed, harrowed, and disced until well pulverized, then seeded to crimson clover, twenty pounds per acre. In May, 1909, after the clover had



ALFALFA ON UNIVERSITY FARM

blossomed and the seed about half matured, the crop was plowed under as green manure, with walking plows. An application of 500 pounds acid phosphate, 16 per cent, was made and thoroughly mixed with the soil by the use of the cutaway and 60-toothed harrow. Later, an application of three tons of ground limestone per acre was made, with a superior fertilizer sower. The soil was then fallowed the remainder of the summer in order to eradicate as many weeds as possible. Sept. 20, 1909, the field was

seeded to alfalfa, 30 pounds per acre. In the following March, 1910, the field had only a partial stand. There was hardly any on the poor knolls. This was partly due to the dry fall and unusually cold winter. On Feb. 24, 1910, an application of ten loads of barn yard manure per acre was made. April 7 the field was re-seeded to alfalfa, 16 pounds per acre; an application of 80 pounds nitrate of soda was also made. There is now a perfect stand, which has already been cut four times, making an average of 2,250 pounds of dry hay per acre at each cutting.

Hog lot number two, just west of the hog barn, is in alfalfa. This lot was seeded on Sept., 1908, to alfalfa 30 pounds per acre. The weeds had been kept out by fallowing, throughout the summer. In the spring of 1909, the field was harrowed with a rotary harrow, in order to kill out the weeds. Five cuttings were taken from this lot as follows: May 3, June 8, July 12, Aug. 19 and Sept. 27, producing an average of 2,000 pounds per acre for each cutting. An application of tankage of 500 pounds was made and harrowed in at the last cutting. The hogs were then pastured on the field for a few weeks, and it held well. The stools sprouted out well last spring, and it has already been cut five times this year, making an average of 2,250 pounds of dry hay to the cutting.

This may seem to many farmers like investing too much money in manures and labor for a profitable crop. We have to prepare our soils and supply them with food for any crop—we can do likewise for alfalfa. The Station Farm had to make an extra seeding of 16 pounds in the spring, but now they have an excellent piece of alfalfa, which yields over five tons of hay, worth $12.50 per ton, and amounts to $62.50 per acre in one season, plus at least one month of hog pasture.

Let us get busy and raise more of the crop that adds nitrogen to the soil, great quantities of flesh to our animals, and much wealth to our bank accounts.

—Judd Brooks, '12.

GROWING ONIONS FROM SEED.

Any light, well-drained soil with a dry subsoil can be made good onion ground, if the following things are done: Removal of rocks, trash, and weed-seed; applying fertilizers and humus; giving clean culture. It usually requires more than one year to make first-class onion ground from common sandy loam, but a profitable crop can be grown the first year, and as onions do well year after year on the same ground, the soil can be made more and more productive each year. The first step in preparation for next spring's crop is the selection of the patch. The land should, of course, be as rich as possible, and not too hilly or rough, as this would make cultivation more difficult. Avoid weedy ground. The most important thing needed by onions, aside from actual plant food, is humus. I cannot too strongly urge the need of humus to onions, especially on sandy soil where considerable fertilizer is used. If it were not so late it would be a very excellent plan to sow buckwheat, rye, wheat, crimson clover, or something to turn under. Since it is so late, manure must be relied upon and very heavy applications will yield profitable returns. If manure is difficult to obtain and a crop of cow-peas, soy-beans, or some other crop is still on the land, it would pay to leave it to turn under. In January, the land should be plowed evenly to a good depth, and left rough for the action of frost. A second light application of manure might now be scattered as a top dressing.

The fertilizers which are to be used on the crop should be on hand and mixed, ready for use in the early part of February. In different localities, different fertilizers are needed, and different sources of the constituents will be most available. A fertilizer running about 3-9-7 with a top dressing of nitrate of soda and plenty of manure or humus will be pretty well suited to most of our sandy loam or dolomite soils. The fertilizer we used on our onions last year was as follows: 1,000 lbs. tankage; 500 lbs. acid phosphate (16%); 280 lbs. muriate of potash; 220 lbs. nitrate of soda; 2,000 lbs. 3-9-7 fertilizer. This was applied at time of seeding and followed by one top dressing of nitrate of soda (75 lbs. per acre). It would probably be better to use less nitrate in the mixture, and use it in two or three top dressings, owing to the great solubility of this salt.

Seed should be bought and its germinating powers tested before planting time. There are many different varieties of onions. They vary in color, size, keeping qualities, and flavor. The Yellow Globe types are most commonly grown in the regular onion-growing sections of the United States, with the exception of Texas and Florida. At the Ohio Experiment Station, about 40 strains of Yellow Globe Danvers and Ohio Yellow Globe were grown last year. These are both good keepers and, while not excessively large, have an attractive appearance. The Prizetaker is about the largest, but is not a good keeper when grown on certain kinds of soil.

When grown as I am going to describe, you will need about five pounds of seed per acre, and to get good seed, you will have to pay from $1.50 to $2.25 per pound.

As soon after the middle of February as the soil permits, the fertilizer is broadcasted both ways with a grain drill, applying 600 to 1,000 lbs. or even more per acre and then thoroughly disked, harrowed, dragged, and anything else to make a perfect seed-bed. The seed is now drilled in rows fourteen inches apart. We use a line for the first row and plant with a garden-seed drill, using a marker, this insures an even distribution in straight parallel rows, which reduces expense in cultivation.

The plants come up and grow slowly at first, but as the warm days of March come they grow faster and should be thinned to about from one to one and one-half inches as soon as you can conveniently, and should be given a top dressing of nitrate of soda. This will hurry them along unless the weather is cold and rainy. They must be frequently cultivated with a wheel hoe at first to prevent weeds from starting and to conserve the moisture; later on, cultivation need not be so frequent. Do not neglect thinning and keeping the rows free from weeds when the plants are quite small, as it is much more difficult to clean out a patch which has become weedy, and it checks the growth of the plants. When the plants are from four to six inches high, they are thinned to about three inches and given a second application of nitrate of soda, which might be followed by a third, after three weeks, if the plants do not seem to be growing well.

Early in July the tops will begin to die and break over. When about two-thirds have died down, it is well to roll a barrel over the patch to break the others down. In about a week they are pulled, throwing eight rows into a windrow, and allowed to cure a week or more. They are then topped and sorted. There are machines for this purpose, but they are expensive, and for the average grower it is better to do this by hand. Three grades are made: "Primes," 1¼ inch and larger; "seconds," ¾ to 1¼ inches; and those below ¾ inch are used as "picklers," or sets for bunch onions. All thick-necked onions must be sorted out, as they will not keep.

Onions must be stored in a dry, airy place, if not to be sold at once. Sometimes they are crated, and the crates stacked in the field and protected from the weather. We stored ours in a dry, airy shed, in layers about three or four inches thick, with a good air space between.

As soon as the crop is removed the land should be sowed to cow-peas, soy-beans, buckwheat, or something which may be turned under to add humus. If this is done the patch will become more productive each year.

If the above outlined plan is followed, you should make at least 400 bushels per acre the first year, with a much larger yield the second.

—H. P. Ogden, '13.

SHEEP SHOW AT THE EXPOSITION.

East Tennessee has not advanced in sheep husbandry as rapidly as is desirable.

There were only three breeds represented at the Exposition, and all of these came from other parts of the State. None of the animals showed that they had been fitted to the extent that would look pleasing to the eye of an English shepherd.

To fit a sheep properly for the show-ring, one must begin feeding it as soon as it is sheared, and keep it up until it is time to show. About the last of July the wool ought to be trimmed to such a length that when you lay your hand flat on the back of the animal and take it off, the wool will spring back to its natural position and not leave any dents in the fleece. It does not need to be trimmed so short on other parts of the body. At intervals of about a week, each animal ought to be gone over with the shears to trim off the fine wool that projects out farther than the rest. Some exhibitors like to color the wool to make it look darker. This should be applied right after each trimming. There are various kinds of coloring material. Almost every exhibitor has his own kind.

The sheep barn was well arranged, both for the exhibitors and the visitors.

Prof. J. E. Hite, of the University of Georgia, placed the ribbons. He did not find it a difficult task, for there was only one exhibitor of each breed.

H. C. Davidson, of Obion, Tenn., was the only exhibitor of Cheviots. They were true to the Cheviot type, and there were some good ones in the flocks. The Cheviot as a mutton producer ranks high, but for wool it is only fair. The fleece is open and long. The head legs are white and free from wool.

Southdowns were shown by R. P. Hite, of Gallatin, Tenn. Several of these were good ones, and they would have been hard for anybody to beat if they had been fitted properly. Southdowns for mutton stand high. The rams are used on the native ewes to produce early lambs. The lambs fatten easily and are ready for market earlier than almost any other breed. They are not so good for wool, but the body, head, and legs are well covered.

Mr. Bell, of Pulaski, Va., showed the only Dorsets. He brought them to sell, and they were not in show condition, but there were some good representatives of the breed shown.

All the exhibitors were pleased with the way they were treated by the men in charge, and thought that the show was a success.

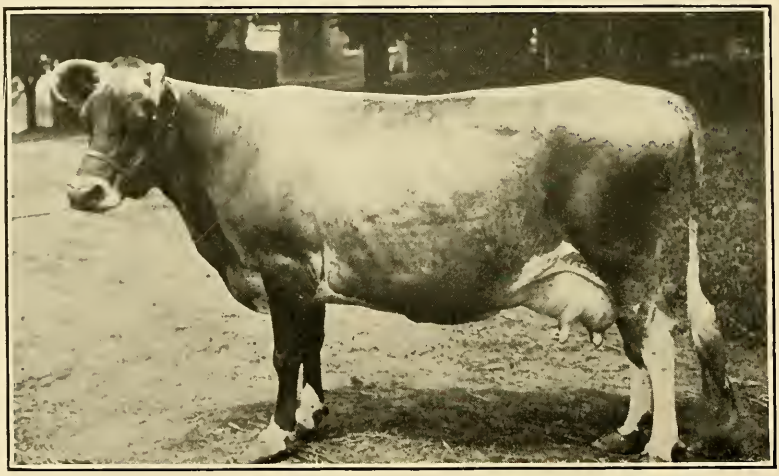
P. P. Hite.

A TENNESSEE JERSEY MAKES BIG RECORD.

(From the Dairy Magazine.)

The list of Jersey cows which have completed authenticated year's tests, with yields of 700 pounds of butter or more, continues to grow larger each year, showing that, as more attention is being paid to testing individuals of the breed, they are becoming quite common.

The 30 cows that are already in this 700-pound list whose records range from 700 pounds, 11 ounces, to 1126 pounds, 6 ounces, in the year, have been bred in different parts of the country, and belong to different families of the Jersey breed. The cow Belle Baronetti, 163613, bred and owned by



BELLE BARONETTI (163613)
Owned by D. S. Williams, Nashville, Tenn.
Yearly Record, 11,113 lbs. Milk, 796 lbs. of Butter.

W. Gettys, of Athens, Tenn., has just recently completed such a test under the supervision of the Tennessee Experiment Station at Knoxville. Her test began July 1, 1909, when she was ten years old, her last calf being dropped June 14, 1909. This cow is out of the same dam as the famous St. Louis test cow Baronetti of Ingleside, and had, previous to this time, made a test of 40 pounds of milk, yielding 3 pounds 8 ounces of butter, in one day. During the 365 days of the recent test, she produced 11,113 pounds of milk, containing 677 pounds of butter fat, which is equivalent to about 796 pounds of butter (85 per cent. fat). Her first month's milk amounted to 984 pounds and her last month's to 793 pounds; the first month's fat yield was 40.6 pounds and the last month's 52.6 pounds. Her best yield for any one month during the year was 1,297.8 pounds of milk

and 78.8 pounds of fat. The average per cent. of fat in her milk for the year was 6.09; the average milk per month, 926 pounds; average fat per month, 56.4 pounds.

This is the first cow to complete an authenticated year's test in Tennessee, but it is by no means an indication that such cows are of so rare occurrence in the State. It simply shows a lack of interest in a matter of much importance to the breeders of the State and to dairy interests in general—the keeping of records of individual cows. Much more attention should be given this matter. Every cow in the State that indicates sufficient capacity should be given a chance to enter the Register of Merit. It is but just to the individual animal and to the breed, and would make money for the owners, as it would tend to call attention to the many excellent individuals of the breed within the State. The character of these tests should not be such as to tend to impair the future usefulness of the animal by excessive feeding, etc., but should consist primarily in keeping an accurate record of the production of milk and butter with no possible harm to the individual.

Belle Baronetti was sold in the Gettys sale on May 19, to D. S. Williams, of Nashville, Tenn., and is now a member of his herd. She topped the sale in the cow class and her offspring also sold very high, her heifer, Fox's Baronetti Belle, being sold to P. Whitaker and Son, of Columbia, Tenn., for $475.00, and one of her sons brought $210.00. This indicates the great advantage to be derived from a yearly test.

—R. M. Murphy, Univ. of Tenn.

STOCK DIVISION OF THE STATE FAIR.

The Stock Show was a success this year in many respects, but there is still room for improvement along some lines. Some of the stock was not in good show condition. This is a point that the farmer who expects to show stock should not overlook; they do not attract the attention of the public as well, and the casual observer and many novice stockmen will overlook good points which well-bred animals possess, but are covered up by raggedness or untidiness. A judge will not be apt to look as carefully for good points on animals that are not well halter-broken as those that are.

Several herds of both beef and dairy breeds were exhibited. The square type of beef animal was well shown in several herds of Shorthorns and Herefords; the barrel type was splendidly brought out in the Angus herds. The Tennessee herds did not attract the attention of the public nearly as well as the Ohio and Kentucky herds, but they took their share of the premiums; this shows the bad effect of not having the herd in show condition. In the dairy breeds, the little Jerseys and Guernseys with a production of quality, but lacking in quantity, were much in evidence; the Holstein, with a production of great quantity, but lacking in quality, was also shown in considerable numbers. The Tennessee Jerseys showed up well. Tennessee needs a cow of greater capacity to consume the great quantity of roughage produced on the farm, and, too, they are more economical producers.

Only the lard type of hog was shown. This was represented by the Berkshire, Poland-china and Duroc-jerseys. Excellent specimens of each breed was shown, and large numbers of each. Tennessee showed much the finest hogs at the fair, and the contrast between the show condition of the herds of cattle and that of the hogs was beyond comparison.

Both the wool and mutton types of sheep were shown in good numbers. The mutton type was much in the majority, and several fine Tennessee herds were shown and compared well with the show herds of other States.

The horse was well represented in the roadster type and ponies, but the drafter was seriously lacking, especially in numbers. Tennessee should have a larger horse on the farm than it has at present. The larger mares are needed to produce larger mules. It is beyond a doubt that the larger mule is more efficient than the small mule we now have. The roadster is all right in its place, but is not a dual-purpose animal. The races in the afternoons and the Horse Show in the evenings were quite entertaining. The horses and ponies were well displayed. Dan Patch was on exhibition. Mules were also shown in large numbers and of excellent types.

—D. C. P.

PRACTICAL AGRICULTURE.

Sometimes we hear people speak of "practical" agriculture and "scientific" agriculture as if they had no connection with each other. On the contrary, they are synonymous terms.

In this day of high cost of living and high-priced labor, no method of carrying on work is practical unless it is done with the least possible expenditure of capital and labor.

The farm is a manufacturing plant producing a large variety of crops and live stock, and should be managed as systematically and progressively as any other factory of the land. If we can make this factory produce crops in places where none have grown before, if we can produce larger yields at small additional cost, if we can produce more live stock and make them pay for themselves, thus improving our factory, we should undoubtedly do so. All these things and more can be, and are being, done by those who understand the underlying principles of agriculture.

Who was it that invented the Babcock testing machine, which has meant hundreds of thousands of dollars in the farmers' pockets? It was the scientific dairyman.

Scientific farming has improved all varieties of plants and breeds of animals, and produced new species to such an extent that they are twice as valuable to the farmer.

It is scientific farming that has started the "Back to the Farm" movement which will be a blessing to the nation. This has been accomplished by improving the farm methods and putting farming on a business basis, by improved health conditions, improved transportation facilities, and by the influence of the State Fairs and agricultural journals which the scientific farmer supports.

No person or class of persons can stand still. They either go forward or backward. The great majority of individuals, and the guild as a whole, are rapidly adopting the scientific and therefore the practical method. No better proof of this is needed than to say that the attendance and interest in agricultural colleges all over the land is rapidly increasing, and they are constantly being compelled to enlarge their facilities.

The agricultural departments are outstripping all other departments. At the University of Tennessee the class shows an increase of one hundred per cent.

An advantage that scientific farming has over other businesses is that the women and children can take an interest and a part in it. This is now very generally being taken advantage of, and is a very favorable sign. It helps to join the family together by common interests, thus making them happy and contented.

The scientific farmer reads the papers and bulletins, thus being able to find out what kinds of crops do best on certain kinds of land, what fertilizer certain land and certain crops require, and what sort of live

stock is best suited to his conditions. To be sure that his conditions are suitable for certain kinds of stock and crops, he makes experiments himself, on a small scale, along lines suggested by his Experiment Station. In this way he learns exactly what suits his individual conditions best.

The man who reads thinks and the man who thinks has power.

The scientific farmer is undoubtedly the practical farmer, for he is the one who makes the money, enjoys life, and who attains to leadership in his community.

—C. E. Allred, '12.

TENNESSEE LIVE STOCK EXPERT.

For some time the University of Tennessee has been casting around for an expert live stock husbandman, and Prof. H. A. Morgan, director of the station, has finally found the right man for the place in Prof. C. A. Willson. This young man was born and reared upon a farm. After completing a course in high school at the age of 18, he managed a stock farm for five years, at the end of which time he entered college. He graduated with honors from the Michigan Agricultural College in 1906, with degree of bachelor of science, and completed a course for the master of science degree at the University of Missouri in 1910. Prof. Willson also served as assistant in animal husbandry at the Kansas State Agricultural College in 1906-7, where he had opportunities for the study of Western steer and lamb-feeding.

From 1907 to 1910 he was connected with the animal husbandry department of the University of Missouri, where he carried on extensive experiments with forage crops for live stock.

Our readers will see, therefore, that this young man comes from the very best with the knowledge and ability to "make good" in our State.

We congratulate the University faculty in securing Prof. Willson, and we wish him great success in his work. We hope, too, that our readers will watch his work carefully and profit by his methods. Our columns are open to him at any and all times.

FARM NOTES.

On visiting the farm after a three months' vacation, the writer was struck with surprise at the amount of work which had been done, and the quantity of feed that is being grown on the same land—two full crops a year. During September and October of 1909, a greater part of the bottom land was seeded to such winter crops as barley and crimson clover, rye and vetch, oats and Canadian peas.

These crops made a splendid growth during the winter. One of the fields of barley, vetch and crimson clover was turned under for green manure April 4th with the deep tillage machine. This being the first trial of the deep tillage machine, it was thought best to check it against a plot that was plowed with the ordinary walking-plow. A strip containing an acre was laid off through the center of the field. This was turned with a two-horse walking-plow. The remainder was plowed with the deep tillage machine, which was operated with four horses, turning the soil fifteen inches deep.

This land was all harrowed several times, until a perfect seed-bed was made. It was seeded to sorghum and peas planted in 24-inch rows. This was cultivated four times during the summer.

They began harvesting the crop for silage September 15th. Any one on going through the sorghum could notice the difference in the growth on the acre plowed by the walking-plow and that on either side of it plowed by the deep tillage machine. After the sorghum was taken off, the stubble of the first acre has some crab grass on it, while the other land is perfectly clean.

On a part of the land where the crop was taken off for hay in the early part of June, the land was turned as soon as the hay was off and seeded to mammoth yellow soy-beans, planted in 24-inch rows. These beans were cultivated 4 times. They are now about waist high, and have a heavy crop of beans setting on. The estimated yield of hay is at one and one-half tons per acre, and eighteen bushels of beans.

Another field was seeded to two rows of soy-beans and two rows of sorghum alternating. This will be turned under with the deep tillage machine before it is frost-bitten. The heavy growth of sorghum will supply abundant humus, and the beans will furnish nitrogen and humus. This land is to be seeded to a mixture of wheat, vetch, and crimson clover, to be turned under in the spring and seeded to corn. This is being done to see just how much green matter can be turned under with making the soil vegetable sour.

One acre of land seeded to Cook's Prolific Corn (the preparation of the land was explained in the May issue of THE FARMER) was harvested September 16, and yielded 117 bushels of grain and 4,000 pounds of stover. Five years ago this acre of land yielded only forty bushels of corn.

EDITORIAL.

In the fifth year of the publication of the U. T. FARMER, we come with higher aspirations of the future of the farmer than ever before.

This statement is based on several facts. Our circulation has grown to such a number that it is possible for us to secure advertisements to help bear the expenses of the publication.

At the close of last year a generous benefactor came to our rescue and placed the paper on a firm footing.

To Mr. George Callahan the Agricultural Club gives its sincerest thanks for the financial aid which he has given the paper.

The enrollment in the Agricultural Department has so increased, that instead of the U. T. FARMER being backed by fifteen or twenty students, we can boast of more than twice that number.

Let us, as students, work together and make an earnest effort to put before the people of the State a paper which will fully represent the work being done in the Agricultural Department, both from an educational standpoint and from the experimental side of better farming, which means a big step forward toward bettering the conditions of our fellow farmers.

The success of the U. T. FARMER can be made much greater by the hearty co-operation of all the students in the Agricultural Department of the University.

The editor requests that all of the students turn in one article each month, on some of the operations of the Experiment Station Farm, or the farm at home, or any other subject that he wishes to discuss.

When we are talking among ourselves, there is a directness and force that commands attention. Let us try the same method on paper. The U. T. FARMER is not the place for so-called "fine writing." It wants every article in its pages to carry a direct message to its readers. Let us try to write as we should talk—simply, clearly, forcefully, and well. It is only by having a large number of articles to select from that the best paper can be made which will be of interest to all of its readers.

PERSONALS.

Professor Morgan made a trip to Montana in September for the purpose of investigating, in behalf of the Bureau of Entomology of the U. S. Department of Agriculture, the work that is being conducted by that Bureau on the spotted fever tick, a pest that is causing loss of life among the inhabitants of the Bitter Root Valley.

It is gratifying to hear that Professor Mooers is steadily improving in health and hopes to return to the University at a not far distant date.

Prof. Keffer took a ten-day trip to Nashville and Memphis, where he was judge of the fruit exhibits in the State and Tri-State Fairs.

During the vacation, Prof. C. H. Lane spent four weeks in the Agricultural Graduate Department of Ames University, Iowa. After his return, he was engaged in teachers' institute work, and was judge of cereals and forage crops at the State and Tri-State Fairs.

Prof. Bentley, assisted by Frank Hines and Chas. Pennington, made a complete canvass of the State, inspecting orchards and nurseries.

Dr. Reynolds taught nature study and the pedagogy of the natural sciences in the Summer School.

L. R. Neil, '07, is connected with the Experiment Station doing co-operative work in middle Tennessee.

A. W. Shofner, '09, is teaching agriculture in Tyner High School, and is doing good work.

R. M. Murphy, '10, is taking graduate work in the University of Wisconsin.

Jno. F. Farrow, '10, is teaching agriculture in Sale Creek High School.

G. R. Worthington, '10, has been at work on the Station Farm, gaining more practical knowledge of agriculture.

O. S. Adsmond, '12, D. C. Parmon, '11, and G. R. Worthington attended the State Fair at Nashville.

Mr. J. E. Hite, '04, is doing extension work at the University of Georgia.

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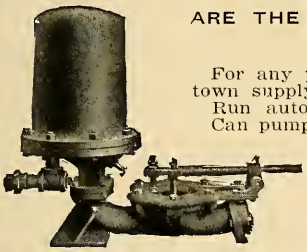

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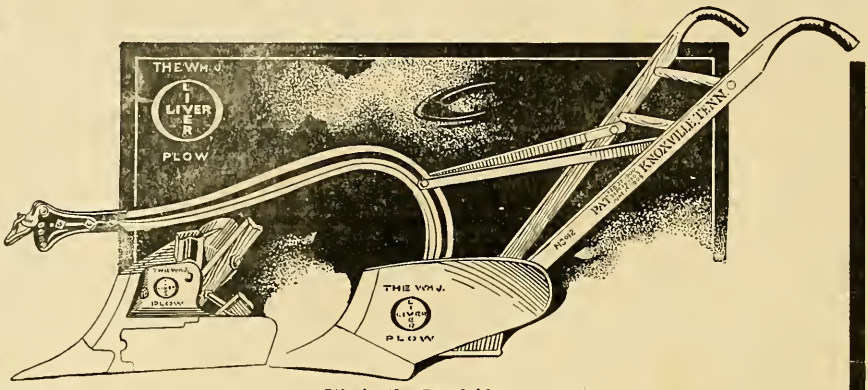

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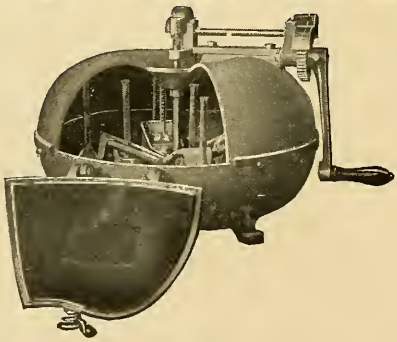

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Vol. V. NOVEMBER 1910 No. 2

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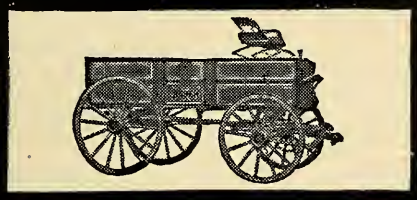

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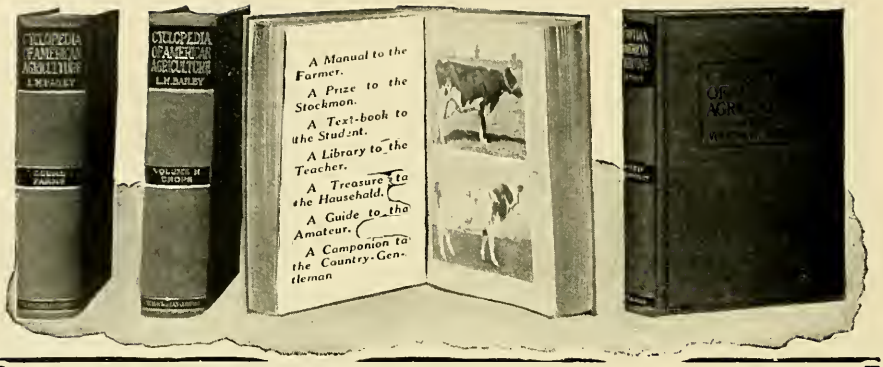

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Humus

By J. F. Voorhees.

A farm without humus is like a man without charity. It is nothing.

Though it be filled with mineral plant food and have abundance of lime, if it have not humus it will not produce.

Though it be thoroughly tilled and not a weed be allowed to grow, if it has not humus the crops will fail.

Humus loosens the soil and prevents baking, humus conserves moisture and prevents damage from drouth. Humus assists drainage and ventilation and warms the soil. Humus furnishes a home for the bacteria that get nitrogen from the air and prepare it for the use of plants.

If we depend on mineral fertilizer we will fail in a dry season. If we depend on tillage we fail in a wet season. But a farm filled with humus never fails entirely, be the season wet or dry.

We should use all three—fertilizer, tillage and humus—but the greatest of these is humus.

THE U. T. FARMER

Vol. 5. NOVEMBER, 1910 No. 2

FRUIT AT THREE FAIRS.

By Prof. C. H. Keffer.

Tennessee has had three great fairs this year, in addition to the local exhibitions in many counties. At all three—the Appalachian Exposition at Knoxville, the State Fair at Nashville, and the Tri-State at Memphis—an effort was made to secure a good display of fruits. The premiums were liberal, and there had been wide-spread advertising. On the whole, the exhibits were a disappointment, but in all three fairs certain facts were developed that seem worthy of a little attention. At the Appalachian Exposition the apples from Hayward County, North Carolina, in variety, and in freedom from defects, would have attracted favorable comment at a national fruit-show. The fruit showed that the orchards in which it grew had been well cared for. The trees had been pruned and sprayed. An interesting feature of this exhibit was the large number of local varieties it contained. The more common commercial sorts, like Ben Davis, Winesap, and York Imperial, were shown, and, in addition, many interesting kinds unknown out of the mountain region, such as the "Mountain Boomer."

As indicating the adaptability of this section to apple culture, these local varieties had an interest, but they do not appeal to the average grower. For him the Tri-State Fair far surpassed the others in interest, chiefly because of the apples shown in one-bushel box lots. Three Arkansas growers showed 10 varieties each in this class. For freedom from defects, grading, and packing, all three deserved high praise, and the winner of the blue ribbon is a master of fruit-growing. An exhibit from Lauderdale County, Tennessee, consisting of 200 bushel boxes of commercial apples —Ben Davis, Black Ben, and Stayman—had all the Arkansans beaten for size, but the fruit had not been sprayed, and there was not a single perfect apple in the whole 200 bushels—scab, or blotch, or scale, or codling moth (sometimes all these) appeared on every apple. The contrast between the perfect fruit from Arkansas and the larger but otherwise inferior fruit from our own grower was as striking as it was instructive. The Tennessee grower was quick to see the difference, and he promised himself that his trees shall be well sprayed next year.

The fruit show at the State Fair, while not more than half as large

as last year, was better in quality. Slowly but surely our fruit-growers are learning to protect their fruit from disease and insects by spraying. Three years ago there was scarcely any evidence of spraying in the State Fair exhibit. This year almost half the fruits shown had been sprayed. Needless to add, the prize money went to the sprayed fruit.

Reverting once more to the Tri-State: The bushel lots—sprayed—from Arkansas sold at the close of the fair for $2.50 per box (one bushel). The unsprayed bushel lots were sold by their grower for $1.50 per box—and the difference in selling price does not fully tell the value of spraying because the larger size of the Tennessee fruit, had it been as clean as the sprayed apples, would have insured for it a higher price.

SOIL IMPROVEMENT.

By J. H. Herron, '14.

To understand soils, one should first acquaint himself with their composition. All soils are composed of decayed rock, together with animal and vegetable matter.

The first form of plant life was very low. Only a low order of plant life could subsist upon the small particles of inorganic matter formed by disintegration of rock, consisting of mosses and lichens, and as it decayed year after year, and became intermingled with the inorganic matter, gave way for a higher order of plant life. After this had taken place, we had a soil composed of organic, as well as inorganic, matter.

We find that to grow a plant successfully, certain elements of which a plant is composed have to be present in the soil. Among the most important ones are nitrogen, potash, phosphoric acid, and lime. Many of these elements are present in the soil in great abundance. In some soils, however, there may be a deficiency in nitrogen, potash, and phosphoric acid.

Our soils have been impoverished by growing cereal crops. Any soil will become poor by growing corn after wheat, and wheat after corn, year after year. These crops add nothing to the soil, but are constantly draining it of its fertility, particularly of nitrogen and phosphoric acid. Surface washing and leaching are two important factors by which soils are made poor.

Surface washing can be prevented by adding humus, and by deep plowing. Deep plowing will not only serve to keep soils from washing, but will turn up new soil, and increase the water-retaining capacity of the soil. Leaching is the washing-away of plant food which is dissolved by water or heavy rains. This can be prevented by leaving on the soil various forms of plant life which have accumulated during the growing season, and also by growing winter cover crops.

Vegetable matter must be added to the soil, plants which will take the element nitrogen from the air and restore its fertility. The most valuable plants for this purpose are the legumes. Among these may be mentioned cow-peas, soy-beans, clover, and alfalfa.

A ton of soy-bean hay contains forty-six pounds of nitrogen, worth eighteen cents per pound; thirteen pounds of phosphoric acid, worth five and one-half cents per pound; and twenty-one pounds of potash, worth six cents per pound. This gives as a total value for the nitrogen, $8.28 in one ton; phosphoric acid, $0.70; potash, $1.26. The total value of a ton of soy-bean hay would therefore be $10.24. An acre should produce two tons of soy-bean hay. The fertilizing value of soy-bean hay which would grow on one acre would be $20.48, to say nothing of the value of stubble and roots.

The organic matter in soils usually gives them a dark color. Through the action of the soil bacteria, or countless millions of minute organisms, the organic matter is decomposed into elements which the plant can use as food. In the intermediate stages of decomposition, this inorganic matter is called humus. This is the chief source of soil nitrogen.

The growing of live stock on the farm will enrich the soil, and innoculate the soil with bacteria.

Crop rotation should be successfully practiced by every farmer. Rotation means the exact opposite of growing the same crop year after year on the same land. Rotation is advantageous in other ways besides building up soil. Rotation will diminish the supply of insects, exterminate weeds, avoid diseases, add vegetable matter and nitrogen to the soil, and distribute the farm labor throughout the year. If the same crop is grown year after year on the same land, the insects which survive the winter will attack the following crop in greater numbers than the preceding one. A similar experience may be had with weeds, and plant diseases, if rotation is not practiced.

A rotation that is sometimes followed is: First year, wheat, followed by clover and grass; this is followed by corn and peas, then by rye, and then by crimson clover.

To summarize: Acquaint yourself with the composition of the soil. Grow winter cover crops to keep your soil from leaching. Grow live stock on the farm. Know the fertilizing value of a ton of pea or bean hay. Practice crop rotation.

SELECTING SEED CORN.

By C. E. Allred, '12.

The selection of seed corn has not received the attention in Tennessee that its importance deserves. We should bestow just as much attention on the selection of our seed corn as we would in selecting the animals for our dairy herd, or any other line of live stock.

Variety.

The first thing to consider in selecting seed corn is the variety. There are about fifteen varieties in common cultivation in the State. Of these fifteen varieties, there are two main divisions, or classes, and the first class is divided into early, medium, and late:

Grain Varieties.

1. Early (120 to 124 days)—Iowa Silver Mine, Leaming, Riley's Favorite, Reid's Yellow Dent.
2. Medium (126 to 136 days)—Boone County White, Hickory King, Webb's Improved Watson, McMackin's Gourdseed.
3. Late (142 days)—Higgs, Huffman, Shaw's Improved.

Silage Varieties.

Medium and Late prolifics (130 to 139 days)—Albemarle, Cocke's Prolific, Marlboro, Sander's Improved.

In selecting a variety of corn, it is necessary to consider the kind of soil, length of season, productiveness of the variety, soil adaptability, vigor, climate, color, and personal likes and dislikes. The silage varieties are planted close and are adapted only to rich land. Cocke's gives slightly the best results on very rich land, while for less fertile land, Albemarle and Marlboro are best.

Of the grain varieties, Huffman has proved the highest producer on rich lowlands, being closely followed by Webb's Improved Watson. On rich upland, Webb's Improved Watson stands highest, Huffman and Hickory King being close competitors. On poor upland, Hickory King stands without a competitor. This variety will give its highest yield only when planted with from 1,500 to 2,000 stalks more per acre than the large varieties are usually planted.

Seed.

Next we come to the selection of the seed, after the variety has been decided upon and a crop grown.

Method.

Picking bags, with straps to sling on your back, are the most convenient thing to use. With one of these on your back, go through the best

part of your best field, and gather the best ears. Carry these to the end of the row, dump in piles, and haul to storing place.

Selecting Ears.

Select ears from stalks having broad, healthy leaves, as these are a desirable characteristic, in that they enable the plant to take up and manufacture more food. Short, thick stalks are desirable, as they can be planted closer, are not so easily blown down, nor so easily broken. Avoid stalks having suckers. The ear should be a medium distance from the ground, being neither too high nor too low.

The ear should hang down somewhat so that it will shed water. The shank should be of medium size and length. Avoid ears having special advantages, such as having grown in extra rich spot or alone, as they might not be good under ordinary conditions. The ears should be well filled at tips and from 9 to 10 inches long in the larger varieties, and from 2¼ to 2½ inches thick when dry. Avoid late maturing ears, as the characteristic of early maturity is desirable, in that it precludes any possible danger from frost.

Two or three times the amount expected to be used should be gathered, as a good part of it will be discarded when it is graded.

Drying.

The next step is drying. The corn should be husked the same day it is gathered, and put away to dry. Permanent corn-racks are the best and most convenient method of storing, but if these are not at hand the ears may be tied with a stout string; be sure that they do not touch each other, and swing down from above. These racks or strings should be placed in a dry, airy place—an open shed or loft, or upstairs, is a splendid place. A number of doors and windows are desirable, and these should be opened on warm autumn days and closed at night. If an early frost comes, just a little fire may be used, but artificial heat must be handled carefully, so as not to get the corn too warm. When it is exposed to the first frost there should be less than 10 per cent of water in the grains, and then no damage will be done by the freeze. During the winter the ears should be stored in mouse-proof boxes or barrels, or may be left hanging if safe and in warm enough place. The ears should not be exposed to too low temperature. It has been found that, taking two like samples and drying and caring for one properly, and leaving the other in the crib, that while there was little difference in germination, the one properly cared for produced 27 per cent more corn than the one left in the crib.

Grading.

Grading, while a very important step, need not take any time from other duties, as it may be done on a wet day during the early spring. The ear should be well filled at tip and butt, grains uniform in size and shape,

and in straight rows. The grains should be deep or long, and should be solid instead of chaffy at the top, while the cob should be small. After having found an ear which fills the requirements as specified above, consider whether or not it is the type of corn that you wish to produce. All planters should keep a certain type in mind, and breed to that end. In the early spring, before planting it is a good idea to germinate 5 or 6 grains from each ear selected, and discard all which germinate imperfectly.

The average production per acre for corn in the United States is only 26 bushels. With proper methods this might easily be doubled—and by far the cheapest method of increasing production is by careful selection of seed corn. There should be a corn breeder in every community testing different varieties and methods, and finding which is best for their particular soils and climate.

CORN AT THE STATE FAIR.

By A. S. Adsmond, '12.

The corn entries at the State Fair this year were considerably heavier than in previous years. The exhibits showed clearly that there are yet many who seem to know little of what constitutes the best type; still, it was encouraging to see that many of the exhibitors had more of an idea what typical corn was than heretofore.

There were five collective exhibits of corn; that is, a collection of varieties of ten ears each, shown by individuals from the State at large. Each exhibitor had from fifteen to thirty varieties, most of the varieties seeming to be true to type and of fair quality. The first prize was awarded Mr. C. S. Looney, Winchester, Franklin County. He showed considerable skill of selection, and had thirty varieties, the greatest number in the whole exhibit. The second prize was awarded Mr. Leazier. His exhibit, though of better quality than Mr. Looney's, had only fifteen varieties. The other three were fair corn, with a few defects in quality.

The named varieties of corn shown in ten ear lots by individuals from the State were mostly good, having from eight to twenty entries under each variety.

The Huffman corn came first, and contained two or three very good lots, one being selected by Mr. Huffman, the originator, and won first prize. The second prize was awarded Mr. Douglas Grey, Clarksville.

Then came Boone County White. This variety was also very good, with the exception of not being quite as uniform in size. The first and second prizes were awarded Mr. Gil T. Buford, Pulaski.

The Tennessee Red Cob and Tennessee White had a few lots in each variety of fairly good corn, but the inclination was toward large ears,

without much regard to uniform grains and ears in each lot. The first prize of Tennessee Red Cob was awarded Mr. S. L. Mitchiner, Gallatin, and second went to Mr. H. K. Morgan, Shelbyville. The prize on Tennessee White was awarded to Miss Nancy Lee Scott, Gallatin, a thirteen-year-old girl, who selected her own corn and won over her father, who received second prize.

The Reid or Leaming type of yellow corn was poor, and did not come up to the standard, so the judges could not award it any first prize. The second prize was won by Mr. P. W. Walker, Buntyn.

The Improved Watson was the best variety exhibited at the Fair. There were about seventeen entries, most of which were very good, so the judges had a hard time in awarding the prizes on account of the close competition. First prize was given Mr. H. K. Morgan, Shelbyville; second prize was won by Mr. C. E. Frey, Clarksville.

Our famous Hickory King corn did not show up very well. There were only a few entries and they were far from the standard. Mr. J. H. Leigh, Franklin, received both first and second prizes.

Iowa Silver Mine came up to the average in only a few of its entries, the rest being poor. The first prize was awarded Miss T. E. Reeves, McLean Station, Nashville. This young lady had done her own selecting, with great success. She also won many other prizes with corn and other farm products. Mr. W. I. Gresham, Murfreesboro, received second prize.

The Yellow Dent, other than Leaming type, was another poor variety, and was awarded only second and third prizes.

The Strawberry, or Red, was not good. There was a tendency toward too large a cob, and grains not compact enough. The prizes were awarded to Mr. R. E. Hopkins, Belfast, first; Mr. W. I. Gresham, Murfreesboro, second.

The other varieties not named, contained twenty entries, with only a few worth considering.

The single ear entries from various counties of the State were fairly well represented from the middle and western portions of the State. Twenty-four counties were represented, with from one to five ears from each county. There was a total of ninety-seven entries. In this lot there were many good ears, and also many poor ones. All the counties were awarded first prizes for the best single ear, except three whose corn did not come up to the standard. They were awarded only second and third. The prizes for the best single ear of the State was awarded to the best ear of the prize-winning ears of the various counties, most of them fine samples of good corn. The sweepstakes ear of the State was of Improved Watson corn, and was awarded Mr. C. M. Webb, Shelbyville, a winner of practically all of the Improved Watson varieties. It was an exceptionally fine ear of corn, carrying out all of the characteristics of its type. It had good length (ten inches), completely filled out at both ends, and had

almost the same diameter from base to tip. The grains were deep and compact with large germs and in straight rows parallel to the cob, which was comparatively small. Considering everything, it was a perfect ear of Improved Watson corn.

The boys' club corn exhibit of ten-ear lots had ten entries of white, and seven entries of red and yellow. The entries of both kinds had the appearance of being from corn-fields above the average, but on the other hand they showed that the boys had not been taught how to select corn for exhibits. The entries therefore did not come up to the standard of the judges, and were awarded second to begin with.

There were a few entries of popcorn, but they were very poor. No prizes had been listed in the catalogue; the judges, however, decided the best and second best entries and turned the question over to the Fair Association as to whether any prizes should be given. This will probably bring about a prize list on popcorn for the following year.

Corn should be selected with the following points in view. First, it must be true to type, carrying out each characteristic of its own variety; second, if a lot of ten or more ears is desired, the size and length of all the ears in the lot should be as near the same as possible; third, each ear should be completely filled out at both ends, almost the same diameter throughout—not too tapering toward the tip, with small cob, grains in straight rows, parallel with the cob, of uniform size, compact, deep and with a large germ. The germ is really the part of the grain that is most important. It has in it the material which produces the sprout, hence the larger the germ the more vigorous the sprout. The corn plants which get the most vigorous start get more of their growth off during the early season while there is plenty of moisture, thus our yields are increased by germ selection. It is also the part of the grain that produces one of the essential foods for both man and beast, namely, the oils.

If the farmers would select their corn with these points in view, not only for exhibition corn with which to win prizes, but also for their seed each year, the corn yield could be increased greatly.

INTENSIVE FARMING FOR SOIL IMPROVEMENT.

By L. R. Neil, '07.

Soil improvement, especially if it is to be accomplished speedily, costs money.

There must be a considerable outlay before there is any income. Draining, limeing, manuring, applying commercial fertilizers, and subsoiling may cost as much as the original cost of the land, or even a good deal more. The proposition is after all such a big one that it discourages the owner of many acres that are in need of improvement. So the wet land is given over to wild grasses and red top, the poorer spots are cultivated at a loss, and the rest of the farm pays the bills by the aid of hard economy.

The time is rapidly coming when people cannot farm poor soil and pay their bills. They must build it up or leave it, or live the lives of the English peasant. It is difficult for one man to improve a large area; extensively farmed land pays small revenues per acre, so that investments are paid for slowly. It is common knowledge that land reaches a price too high for exclusive grazing long before it is too high for growing grain, and that often if it is too high for the grain farmer, the potato or onion grower may make it pay well, and it may still be put to a use—fruit growing—that will yield far greater returns per acre.

The cost of putting in tile-drains is very considerable, often equal or greater than the original cost of the land. Yet if a crop of alfalfa, potatoes, asparagus, onions, or cabbage can be grown immediately, the outlay can often be paid for with the net profits of the first year, and there still be something left for living expenses. Frequently, $15.00 to $30.00 spent for manures and commercial fertilizers will produce tobacco or potatoes worth from $50.00 to $100.00. The net profit is fine, but that is not all—the application of plant food has been far in excess to the needs of the one crop, and the land is made better for several years, and permanently better if properly farmed in the future. I have known of applications of fertilizer to be made on the potato crop that would make the land better for the life of a generation, and the increased yield of the first crop more than paid all expenses.

When intensive farming is practiced in the South, two and three crops can be grown on the same acre per year. This is a great help in getting the money spent on soil investment, refunded. The writer has in mind some land that was treated with about 6 tons of stable manure and sowed to clovers and grasses last fall. This year three crops of clover and tall oat-grass were cut, and there is some fall pasture. The second cutting of hay was made in time to sow soy-beans and make a good crop

of them, and this latter crop would have come off in time to sow wheat. Three crops were possible where things were on time, but under extensive methods they would hardly ever be secured.

Under intensive methods, the land is kept growing something all the time. The money crops are harvested, and if the land can do nothing else, it can grow a green manure crop that will add nitrogen and humus to the soil, and this crop will usually be made to pay for the seed and the cost of sowing by the pasture it affords.

HOG PASTURES.

By Judd Brooks, '12.

On the University Station Farm, six lots or pastures are fenced off just West of the hog barn, and are used as hog pastures. They are of the clay loam type of soil, having a gradual slope to the South. Each pasture contains about 2/5 of an acre. They are so arranged as to have a small lane along the South side, through which the hogs may gain entrance to each lot.

Pasture No. I has been in Bermuda grass for several years—the stalls on the north side of the hog barn have their entrance into this lot. It is made a permanent pasture throughout the year, or during the growing season of the grass, and is used as a place for the hogs to exercise in during the winter. The brood sows and two boars have the run of this pasture most of the time. Of course there are partition fences through it, in order to separate the different animals. This one little lot, at the cost of 35 cents per hog a month, would amount to about $10.00 to $12.00 in one season.

Lot II has been in alfalfa since the fall of 1908. It has produced five crops of one ton per cutting during the summers of 1909 and 1910; the sum total in dry hay for the two years amounts to something over ten tons of hay per acre, an average for ten cuttings This is worth at least $12.50 per ton on the market, and would amount to $62.50 per year, or $125.00 for the two years, plus at least three or four weeks of hog pasture each fall. The plant is also considered as one of the best forage crops to be used for pasture, as it does not require as much of the costly nitrogenous substitute to balance the ration. It is almost a balanced ration in itself. The ratio of the ration is 1 to 3.6, and the digestible nutrients in 100 pounds are as follows: Dry matter, 28.2%; protein, 3.9%; carbohydrates, 12.7%; fat, 0.5%. These food nutrients, bought in the form of tankage or some other commercial food, would cost considerable.

Pasture III, just west of No. II, was seeded to barley, 63 lbs., and crimson clover, 13 lbs. per acre, July 1, 1909, and on Nov. 3rd the hogs

were turned on this pasture—the clover was about 4 inches high, the barley 8 inches high, and covered about 80% of the ground. Of course the hogs were not left on this lot very long, but changed back to the alfalfa and grass. In March, 1910, the clover and barley had come out to almost a perfect stand. They were rotated with the hogs, a week on and a week or maybe two weeks off, until late in May, when the pasture became stemmy and tough. It was plowed in June and seeded to sorghum later. The sorghum grew so fast that the hogs could not eat it off. In September, the crop was used for ensilage, making near four tons per acre. In this case, we have a pasture that held well and made a very economical return for the investment, but the crop had to be supplemented by more other nitrogenous food than did alfalfa. The digestive nutrients of sorghum in 100 pounds are as follows: Dry matter, 20.6%; protein, 0.6%; carbohydrates, 12.2%; fat, 0.4%.

Lot IV was seeded to wheat, 50 lbs., and alsike clover, 11 lbs., on Aug. 26, 1909. The hogs were turned to this pasture in November for a short while, a few days perhaps, and then into lot V, in order to keep rotating and to give each crop a chance to revive. This pasture, after being eaten off several times during the winter, was looking fine in March, 1910. It was noticed that the wheat grew off faster than did the barley, and the cause of this was attributed to its having a deeper root system than the barley; therefore, it would obtain more food below the frozen surface during the winter. The hogs were turned into the lot continually until the wheat had headed out well. The 25 hogs, shoats, and pigs in the rotation could not do anything with that group of pastures. The land was plowed and seeded to sorghum in June—the sorghum could not be kept pastured down. The digestive nutrients in 100 pounds of wheat are: Dry matter, 20.1%; protein, 1.8%; carbohydrates, 11.1%; fat, 0.4% a very good pasture, but should be used with other feeds.

Pasture V aroused much interest among the visitors to the farm who knew of this lot. It was plowed, pulverized, and sown—the east half to wheat, 55 lbs., and the west half to barley, 54 lbs., per acre, and the entire field was seeded to crimson clover, 25 lbs., per acre. The hogs were allowed the run of this pasture, Oct. 8, 1909, and to the great astonishment of many, the wheat half was not eaten near as close as the barley half. On April 8, 1910, the wheat, after being in the rotation of pastures throughout the winter, was 16 to 17 inches high, while the barley was from 14 to 15 inches high. The hogs were on the pasture on April 30, and the wheat is still in the lead. We infer from this that the barley pasture is relished more by the hogs than the wheat, although it may be because the barley is finer stemmed.

Lot VI, just west of V, was sown to barley, 63 lbs., and crimson clover, 13 lbs., per acre, in the fall of 1909. This field was taken into the

pasture rotation, and made a very economical pasture for the hogs during the winter and spring.

We can clearly see from the above data of the six small hog pastures, all together making only 2 2/5 acres, that a very economical feed for hogs can be had. The preparation of the land, the seed, and seeding cost very little and the hogs were on pasture throughout the entire year, using wheat and clover during winter, and sorghum and alfalfa in the summer. After all, we find it isn't such a money-losing proposition to raise hogs when we can—and most any farmer can—furnish pastures to supplement a greater portion of his feeds.

WHY NOT SYSTEMATIZE AGRICULTURE?

By W. M. Brown.

Agriculture is one of our largest industries. There is no enterprise that offers such broad fields for development, or is so sorely in need of the application of more business-like principles. We people of the Southland have in our soil a mine that can give far more satisfaction than the gold-fields of the West or the diamond regions of Australia, if we only knew how to manage to get the greatest returns from the soil.

The world is in dire need of more farm products, and we have in our possession the factory from which we can produce these much-needed products, if we operate this factory upon a business basis. The value of our farm crops and animals is now large, reaching above eight billions, exceeded only by all manufactured products combined. But why not, when it is in our power, make two ears of corn grow where one now grows, and raise two animals to the one we now have?

According to my view of the situation, the solution lies in the systematization of all lines of agriculture and putting it on a par with the greatest of industries. Look to the large corporations, the railroads, and the banks—how do we find them managed? There may be few or many departments, separate and independent, so far as the details of the work are concerned, but they are subject to control, as to general policies, by some central directorate of business men or financiers. These men, by a careful study of their business, know before they begin, just how much they are investing, how much their labor is to cost, and what the returns are to be. Money has been readily invested in such enterprises, because (1) the materials and processes are understood and control is certain, and (2) labor can easily be obtained and is under directive control, therefore the products of labor are certain.

One of the most important needs of today is the application of such principles and control to agriculture. How many of our farmers know

the cost of raising an animal, the cost of production of the various crops, the loss and gain? I would say that the number is few as compared with the opposite class.

What is the reason for this? It is not that the industry is not important and interesting, but for the reason that this line of development has not attracted capital, which together with brains, is necessary for the fullest development of any enterprise.

Then, too, there is no organization among the farmers, except in a few lines such as dairying, fruit-growing in some sections, and cotton-raising on large plantations, and, we might say, the Farmers' Co-operative Educational Union, which is doing a great work in many sections. Without organization for the most part, the farming operations have been carried on by individual effort, and the capital owned by the farmers and by a few others who see the great benefits to be derived from agriculture. This can be accounted for by two reasons: (1) The business is not understood by the farmer in most cases, or if he does understand, the lack of capital hinders his putting into operation what he knows, and therefore, in contrast to other industries, the control of the material is uncertain; and (2) The labor has at all times been inadequate in amount, and without any classification and with no intelligent directive control, so the products of labor are uncertain. The average fellows—thousands of them even from the farms—prefer to work in mines, factories, and other sweat-shops to working on the farm for the aforesaid reason.

Now, in view of these facts, we must revolutionize agriculture, in that we must change many methods of the present day; we must systematize this great industry, applying the same methods of control and operations that the banker or the financier applies to his. To this end, the farmer must be educated to know the different phases of this all-important subject, and must study method of controlling all such operations. He must know and determine the use of the soil, which is the material to be used. He must be able to know what crops are adapted to different types of land and how to get the most from these crops, still maintaining the fertility to the highest possible degree. When the farmers know and understand these principles, we may look for a change.

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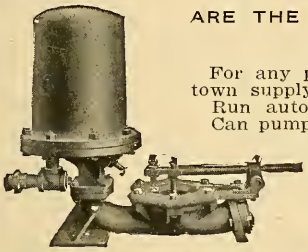

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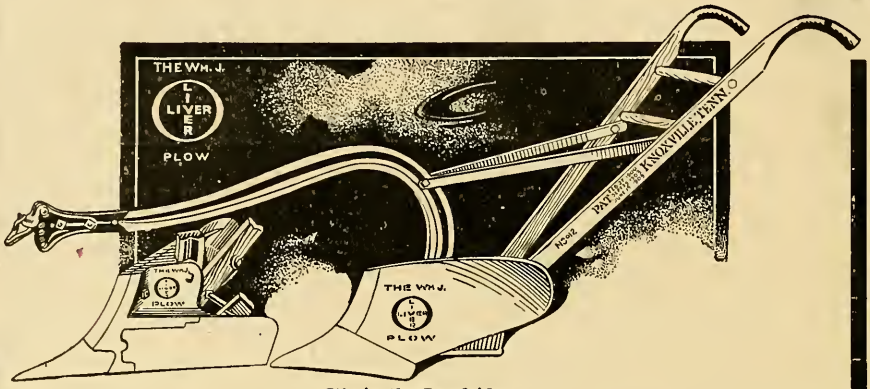

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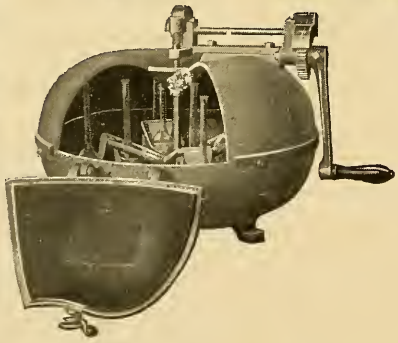

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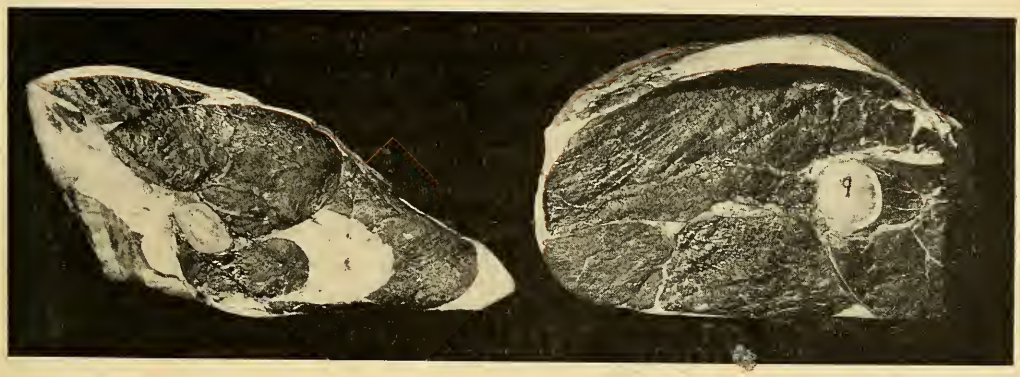

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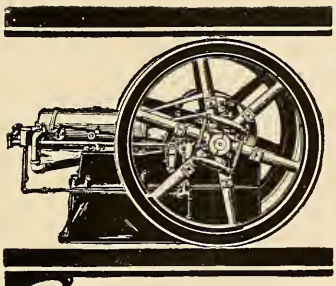

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THE SHORT COURSE IN AGRICULTURE

By PHIL S. TAYLOR.

I. The Student's Viewpoint.

The practical success of our agricultural schools must depend upon the results they achieve in improving the average farming of the State and nation. Hence, it is of vital importance that these schools appeal to what may be termed the great middle class of farmers—composed of men who own small farms, and do most of their own work. But, unfortunately, few of this class can spare the time or means needed to attend a regular course in agriculture, covering two, three, or four years.

Out of this condition arose the necessity and demand for a short, intensely practical course, which would neither consume much of the farmer's time, nor make serious drafts upon his pocketbook, and which would, at the same time, afford him opportunity to become familiar with the working principles of scientific agriculture. Our State instructors saw this, and the result was the establishment of the Winter Short Course given each year.

How does this course appeal to the farmer, and how does it impress him when he attends?

First. It is brief. Lasting just eight weeks and coming in the winter months of January and February, it gives the farmer the best possible chance to attend, since these are the months of greatest leisure on the farm.

Second. It is divided into two sections of one month each, so the farmer may attend the section which treats of his particular kind of work, whether grain and hay raising and live stock, or trucking and dairying.

Third. The Short Course is both practical and practicable. The common opinion about agricultural schools is that they are strong on theory and weak on practice—that they teach "book-farming" and not the commonsense kind that will fit the average farm. To disprove this, I need only point out that but two text-books are used in the Short Course, and that their use is not compulsory upon the students, they being largely used for reference. The student is told absolutely nothing that cannot, in some degree, help him on his return to the farm. He sees, handles, and judges live stock—is shown how to pick the dairy type, the beef

type, how to feed them for the most milk, or to make them show the greatest gain on the cheapest ration in the shortest time. He learns to select the best seed-corn, how to raise most of it per acre, and to make that acre produce more next year than it did this. He is led into the mysteries of commercial fertilizers, and is shown how to mix the kind that his crop and soil needs with his own hands, and thereby keep in his "jeans" the $5 and $10 per ton he has been paying the manufacturer for doing this mixing. This one lesson, if learned by every farmer in Tennessee, would save them a million dollars a year!

Fourth. The Short Course is inexpensive. Absolutely no charge is made for tuition. Board, railroad fare, and incidentals need not cost more than $50 for the entire eight weeks.

Fifth. It starts the farm boy on the road to prosperity. I know one young man who attended two short courses, several years ago, who is now clearing up $2,000 to $3,000 per year, and he attributes his prosperity to what he learned there at Knoxville.

He who would win, must prepare for the race. The leaders in every pursuit today are the ones who mastered that pursuit yesterday. It is a day of specialists. The youth of the land are crowding all manner of schools for instruction in all manner of work. There are schools of law, medicine, theology, dentistry, mining, engineering, journalism, milling, telegraphy, salesmanship, and a dozen others. Before long, we shall have schools wherein to learn the science of sailing through the air, without waiting for our natural wings—and then, I think, we farmers may catch up with the rest of mankind!

But, seriously, why should the farmer not get ready for his lifework by educating himself for it, as men do for other vocations? Farming is now upon the plane of a profession, along with law or medicine and the rest. Is there a single good reason why any Tennesseean who expects to farm should not take the helping hand his State outreaches? Men pay for a chance to learn law—they recognize that special preparation is absolutely necessary for success. What is true of the lawyer, is just as true of the farmer, and more so, for the farmer must deal with not only mankind, but with all the laws that govern soil and plant and animal! Get ready and come to Knoxville in January. If you can't come yourself, send your boy—the one you plan to keep there with you on the farm. Let him hear the gospel of the New Agriculture, and you will not regret it, nor will your son, nor the farm, nor the nation!

II. The Instructor's Viewpoint.

By PROF. C. A. KEFFER.

The Twelfth Annual Short Course in Agriculture will begin at the University at 9 a. m., January 2, 1911, and continue eight weeks.

Since its inception, eleven years ago, the Short Course has filled a

need not otherwise satisfied in the scheme of agricultural education. It was felt that the Farmers' Institute, continuing from one to three days, did not afford opportunity for systematic instruction—of necessity, too many topics were touched upon for more than a suggestion to be given of each. On the other hand, the two-year and four-year courses were not available for the managers of farms, whose operations required their presence during the growing season. The two-year course, indeed, met no need, and has been abandoned. The four-year course, has been perfected until it stands today the equal of the best in the country, and no Tennessee boy need ever again leave his State in order to secure a strong agricultural course of study—one rich in the sciences on which agriculture is based, and equally full of the technical instruction which, in the minds of most people, constitutes the whole of college work in agriculture.

The ideal short course in agriculture must keep in view both the condition of the student when he enters, and the purpose for which he comes. He is direct from the farm. He proposes to return there and apply on his own land what he has learned while at the University. As a rule, he has had practical experience in some or all lines of agricultural work; and this experience prepares him to quickly grasp those ideas advanced by his teachers that to him are practical. As a rule, too, his reading has been confined more or less to the agricultural papers, and he has judged what he has read by the same standard that he applies to the Short Course work, accepting what he can apply, and discarding, as impractical, what does not appeal to his common sense.

Young and old (and every year the professors find themselves facing their elders) have this great advantage over the average student of the University: Coming for a brief time, with a definite purpose, they bring to the College an enthusiasm and an understanding of farm problems based on field experience, and they want these problems solved.

So the professors welcome the "Shorthorns," and the two months' association is quite as interesting to teacher as to student. It keeps a teacher at his best to realize that the men before him are expecting a definite message at every class hour, and that this message is weighed always as to its value in farm production. There is quickly established between the class and the professor a unity of effort that makes for rapid progress, and as a result, much more seems to be accomplished by the Short Course men, in proportion to the time spent at the University, than by the regular students.

Demonstration methods are largely employed in the Short Course. The farmer, like everybody else, likes "to be shown." And the farmer-student spends much the greater part of his brief stay at the University in learning by doing. He becomes a grafter—in no slang sense—and his grafts grow. He prunes and he sprays. It is quite different from hearing a man talk about grafting and pruning and spraying, and the practice abides with him far longer than the spoken word.

He judges cattle, both of beef and dairy type, and he learns the strong and weak points of the beasties by handling them. He makes butter, not with the old-fashioned dasher churn, and little paddle, but with up-to-date creamery apparatus—indeed, the eight weeks is so full of useful methods, every one of which meets his approval as being applicable at home, that he leaves the University full of inspiration for better work, and not a few farms in Tennessee attest his earnestness and the usefulness of the Short Course.

The forthcoming Short Course gives promise of surpassing all its predecessors in point of attendance and enthusiasm. The College of Agriculture is better equipped for the work than ever before. A change has been made in the instruction. Field crops, Fertilizers, and Soils will be coupled with Animal Husbandry for the first month, instead of running separately for two-week periods. In the same way, Dairying and Horticulture will run throughout the second month. The greater variety thus gained should add to the interest and usefulness of the course. Let every reader of the U. T. FARMER tell all his friends of the Short Course in Agriculture, and advise them to be here.

POSSIBILITIES OF POULTRY KEEPING FOR THE GENERAL FARMER.

By V. S. BRIGHT, '07.

That which we may reasonably expect from the poultry business is well shown in the figures given below. In the compilation of the figures, we have been careful to use only those that may be applicable to the general farmer's conditions. It is our aim to give only facts, leaving the fanciful out of the question. We have every reason to believe the figures given will in a general way coincide with the results that the average farmer will secure from a flock of fifty hens in most any section of Tennessee.

As will be shown, the results obtained have been worked out in the writer's own yards for the last three years. We have compiled these totals, and consider only the market value of stock and eggs to the consumer. The fancy show birds will be left entirely out of the discussion, because conditions do not exist on the average farm for the production of show birds.

Feed Cost per Hen per Year.

For the past three years the price of feed has been higher than we have ever known. Where everything except beef scraps was grown on the farm, a hen could be fed for one year for 90 cents, selling everything to her at market price. But where all grain was bought (wheat, oats, and

corn), in addition to beef scraps, the cost for feed per hen per year was $1.40 for a flock of 100 hens. In both cases the flock had a run of rye and crimson clover provided for them in winter and spring, and unlimited grass for summer.

The method of feeding was to feed about six pints of whole corn at morning for about eight months of the year, beginning with October and ending with May. At night the flock was given about one gallon of corn, oats, and wheat, equal parts by measure, and also given access to a hopper containing a dry mash. The mash was made as follows: Wheat bran, 100 lbs.; cornmeal, 100 lbs.; beef scraps, 60 lbs.; protein, 25 lbs.; charcoal, 2 lbs.; oyster shell, 5 lbs.; No. 2 crystal grit, 5 lbs. The remaining four months nothing was fed at morning, and the mash was gradually taken away. The flock was given good open-front houses, kept up only eleven days during a year on account of inclement weather. The flock was given all the range it wanted to take.

Laying Capacity of Some Flocks.

We have and know of many exceptional layers; but what may the general farmer expect from his flock, say 40 to 100 hens? We have direct information for this article from twelve reliable breeders, whose flocks range from 100 to 400 birds. The average of the twelve for one year was 162. These flocks represent Barred and White Plymouth Rocks, Rhode Island Reds, White Wyandottes, White and Brown Leghorns, Black Minorcas, and Brahmas. In our own flock of Barred Plymouth Rocks, it is not hard to get 140 eggs in a year.

The Price of Eggs.

The price of eggs, as we all know, varies as the season; hence, figures that are average are all that can be given. Beginning with July, 1909, the prices of eggs on the local market in Chattanooga, that would be paid to any farmer who offered eggs for sale, were as follows: July, 25 cents; August, 25 cents; September, 27½ cents; October, 25 cents; November, 28 cents; December, 33 cents; January, 40 cents; February, 38 cents; March, 30 cents; April, 22 cents; May, 18 cents; and June, 22 cents. From these monthly prices we can obtain an average price of 27¾ cents per dozen for the year. An authority has stated that the average yearly price for eggs in his small town was 24 cents per dozen by the year.

To sum up the totals, we find that on the average a hen may be fed for $1.15 per year on the average Tennessee farm; then, if a flock will average 140 eggs per year, their product is worth just $2.91⅔; the cost of feeding is $1.15. Now deduct 25 per cent. (73 cents) for labor, repairs, housing, etc., and we have a net profit of $1.03 per head per year. If there is any other business that will, with the same running expense and investment, approach these returns, we haven't heard of it.

Where the Trouble is With the General Farmer.

The failure of the poultry business on the general farm can always be attributed to one of several causes, but the principal one is improper feeding and housing. On many farms the hens are never fed or watered, or housed, and, of course, no eggs will be the result, for at least two-thirds of the year. If the general farmer who keeps about 40 to 100 hens on his farm would give them one feed each day during the year, supply grit, drinking water, a cheap open-front house, and give them some animal food, like beef scraps or green bone, during four months of the year, the egg output in Tennessee would be four times as large as it is today, for a very small outlay of labor. A farmer need not spend over thirty minutes daily with his poultry, and for this expenditure would gather a neat little income.

FEEDING STEERS FOR THE BEEF MARKET AT A PROFIT WITHOUT THE SILO.

By D. A. RUSSELL (Special).

The average farmer of today has the idea that he cannot feed steers for the beef market at a profit, without the use of the silo. Steers may be fed in the early fall, as well as in the winter, which has heretofore been the prevailing time for farmers who have silos.

Silos are used because they render the corn and cane stalks more palatable for the winter feeding, and it is this palatable food that the steers demand. Though we, as farmers, will agree that corn and cane, cut and fed directly out of the field to the steers, is more palatable than at any other time.

I can best tell you how steers are fed to a profit, by giving you an example.

A small herd was bought in November, 1909. The steers were fed wheat and oat straw and coarse hay through the winter, and allowed the range of a forty-acre blue grass field. In the spring, when the grass furnished sufficient pasture, the ration of straw was stopped. They were kept on this blue grass pasture, until July 20th. Then they were put in a twenty-acre clover field, which had just been mowed, and on August 15th they began to receive about ten stalks of green corn, with the ears on them, a day. This was supplemented with a good amount of green stalks, from which the ears had been pulled off for pigs. When the pigs were put on the market, the steers were fed sugar-cane instead of the stalk corn. The ears were steadily increased, until they were receiving about thirty stalks and ears a day. They were sold October 15th, in good beef condition, and at a price above the average of fall grazers.

The steers cost $681.87, including interest at 6 per cent. from November, 1909, to October, 1910, when they were sold for $1,011.37, making a gain of $329.50.

The manure is evenly scattered over the field, and the expense of hauling out the manure is saved, also the expense of putting the corn and cane into a silo and the expense of building a silo.

May it not be claimed by this experiment that the silo is the thing for the dairyman, but not necessary for the Tennessee beef producer?

REVIEW OF OHIO BULLETIN 212.

By W. K. TIPTON, '12.

The Ohio Experiment Station began four years ago the study of the shape of the ear to the yield, the filling of the tip, the indentation of the kernel, the weight of the ear, and the effect of previous environment upon the value of the seed-corn.

These tests have been carried on with the following four varieties: Clarage, Leaming, Drake County Mammoth, and Reid's Yellow Dent, planted in tenth-acre plots, on land which has been treated exactly alike during each of the past sixteen years.

Long Ears vs. Short Ears.

The first test is made with ten plots, testing the effects of selection of long and short ears of the same variety.

Two plots are seeded to corn selected continuously for four years of the long and short types of the same variety. The results of the tabulated table of two types of each variety gives an increase of 5.18 bushels per acre in favor of the long ears. The short ears were larger in circumference than the long ears, when the first selection was made, the short ears averaging 7.1 inches and long ears 9.4 inches long.

Composite samples were taken from thirty-nine ears of each of these types and planted on adjoining plots, no effort being made to keep them from mixing. The length of each ear grown from these plots was measured. The average length of the short ears was 7.12 inches and of the long ears was 7.56 inches.

The conclusion is that, in a quantity of seed corn composed of ears below the average length and ears above the average length, the long ears will outyield the short ears.

The greatest difference noticed is due to the lessened yield resulting from the selection for short ears rather than the increased yield from the selection for long ears.

Cylindrical Ears vs. Tapering Ears.

The cylindricity of ears of corn has been insisted upon more than any other one feature in the breeding of show corn.

In 1906 the Ohio station took up the investigation of the comparative yields of the two types. To do this ears were selected from each variety which varied as widely in each direction as possible to find.

The gain in yield in 1906 in the Leaming and Drake County Mammoth was 4.74 bushels per acre in favor of the tapering ears. In 1907 was .37 bushels in favor of the cylindrical ears. In 1908 .21 bushels in favor of the tapering ears. In 1909, 1.08 bushels per acre in favor of the cylindrical ears. The combined average of the four years shows a gain of .87 bushels in favor of the tapering ears. From the short time that this experiment has been going on, the conclusion is that this characteristic is of minor importance and is not to be discriminated against with the same degree of consistency as is the long and short ear.

Bare Tips vs. Filled Tips.

In 1907 a test was started comparing ears having ¾ to 1½ inches of bare cobs at the tip with the filled tipped ears. The average of the two plots planted with seed from bare tips was 58.21 bu.; the average of the plots planted with the filled tips was 57.79 bushels. The following year the plots were planted from twenty-five ears of similar types selected from each of the plots of 1907. The results were 64.07 bushels for the bare tips and 65.52 bushels for the filled tips. The selection was made in the same manner for 1909, and the results were 84.37 bushels for the bare tips and 86.56 for the filled tips. The habit of these groups to reproduce their characteristic tip is noted from the fact that only 3.7 per cent. of the ears grown from the seed ears having bare tips had completely filled tips, while 20 per cent. of the ears grown from the filled tipped seed had filled tips. The greater part of the ears and nubbins in both lots were more or less bare at the tips.

The continued selection of ears having bare tips will increase the percentage of ears having bare tips and reduce the yield of corn.

Rough Ears vs. Smooth-Dented Ears.

This relation between the two types of corn of the same variety has been tested in the ear-row test and in the plot. The result of the ear-row test shows 2.84 bushels per acre in favor of the smooth type.

The result of the plot work of 1908 shows a gain of .99 bushels per acre in favor of the rough-dented ears, and in 1909 a gain of 2.17 bushels per acre in favor of the smooth-dented ears. The result of the ear-row test, and plot test gives the gain in favor of the smooth-dent ear.

Heavy vs. Light Seed Ears.

To make this test 400 ears were selected. The heaviest 40 per cent. was taken for one group and the lightest 40 per cent. for the other group. The average difference in weight was found to be 2.46 ounces per ear and the difference in yield 2.08 bushels per acre.

The author says that this test will have to continue longer before any definite conclusions can be drawn. But for the present it may be said that the weight of the ear is worthy of attention in the selection of seed corn.

Effect of Environment.

In order to study the effects of previous conditions of growth upon future crops, in 1906 seed was selected from a plot which was manured twice in the five-year rotation for sixteen years, and other seed from a plot not fertilized during sixteen years.

These seed ears were planted side by side in favorable soil of the regular variety test plots. In 1907 the strain selected from the poor land led by .98 bushel.

In 1908 the rich land strain led by 2.32 bushels. In 1909 the poor land strain led by 3.80 bushels. The average gain for the poor land strain for three years is .82 bushel.

To verify this test from another source, seed ears were selected under conditions of a normal stand with ears taken from a wagon without knowledge of the stand. In each instance the best seed ears were selected. The average of the tests for three years gave the seed ears selected from a normal stand an increase in yield of 2.36 bushels over the other ears.

Seed ears which are inferior in size and appearance because of environment are not necessarily inferior in hereditary value.

The Germination Box.

With the germination box as an index to high yielding ears, a number of tests have been made along the line of quick and slow germinating ears for high and low yields. Six hundred ears were germinated in a box of clay loam soil, data being taken twice every twenty-four hours. In four lots of 150 ears each the ten which came through the ground first and the ten which came through last were considered. Composite samples were taken from each of these groups and planted on two tenth-acre plots. The results were 66.66 bushels for the quick germinating ears and 69.16 for the slow germinating ears. About the same difference of time in germination was noticeable in the plot tests as in the box tests. The difference in time of germination is thought to be due to the difference in hardness of the kernels, this making a difference in ab-

sorbing moisture. The germination box is very useful in weeding out ears that will not germinate at all.

Adaptability.

Many farmers make a great mistake in buying large quantities of seed corn from distant seed houses and corn breeders. This habit is stimulated by the corn shows and high prizes offered for best corn. If a farmer wishes to raise a kind of corn which he has seen growing somewhere else, he should plant only a small quantity of it and select the best from that for his regular crop.

In some cases it may require several years to get a corn acclimated so it will produce its maximum yield.

Full Stand.

This fact is appreciated by all farmers, but is secured by only a few. A number of tests were made with rows forty-two inches each way, and one, two, three, four and five stalks to the hill. In these tests sufficient seed was planted and thinned to the required stand. The highest yield was from the four-stalks-to-the-hill plot, or 14,220 stalks to the acre. The regular way of planting corn in Ohio and Illinois is three stalks in hills thirty-six by forty-two inches, or 12,400 stalks per acre.

COUNTY FAIRS.

By JNO. F. FARROW, '10.

It has been said, and truthfully, too, that the county fair offers the best opportunity of judging the progress of that particular county.

The old and the young alike look forward to the day when all will meet at the county seat, and there put on exhibition the best things raised at home. Every child is confident that his or her exhibit will head all the others, and this spirit, more or less, pervades the whole family. We can see the boy as he carefully selects the largest melon in the patch, and, by pa's aid, stores it away till the fair. And Jennie, too, has had her eye on one particular chicken, a large, fine specimen of a pure breed, ever since he was hatched, and she declares that he is the finest chicken in that country, and begins at once her preparations for getting him to the fair. The spirit is catching, and soon the mother and father decide to enter something from the farm, being as Jennie and Johnny are so intent on it. The truth of the business is, that the old man is as anxious to enter in that fair as his son, and nothing short of a calamity would prevent him from showing something at that county fair.

The day comes, and all climb into their carryall and pull out for the county seat. Many arguments ensue on the road as to the relative

merits of their respective exhibits, and each is filled with visions of blue and red ribbons. And now they are on the grounds, and the dreams of the past few months have become a reality. The arrangement and grooming of the exhibits being completed, the family begin to look around to see what the other fellow brought, and right here is where the greatest value of the county fair lies. Johnny's eyes alight on a melon, of similar size to his, but somehow or other his melon doesn't measure up to that one. Johnny thinks it is his imagination, at first, but pa's declaration, that his melon was not half as good as that one, convinces him for sure. Johnny, nothing daunted, begins to wonder why? He finds that the owner had pulled it before the sun had turned it; also, that the rind had a greener and a greasier appearance, and that the shape was much better. Johnny reads on the card attached that the owner used such and such a fertilizer, cultivated after such and such a method, and before he leaves that melon, he has gotten a watermelon lesson that will remain with him all his life; and so it is with the whole family. Jennie finds chicken after chicken which seems better than hers, and by the time the family have gone the rounds, none of them feel that any blue ribbon will come to them that day.

And while no first prize was awarded them, the judges decided that Jennie's rooster was deserving of a second prize, and proceeded to annex the red ribbon. This lone prize constituted tthe prizes won by the family that day, but it was ample consolation, and that evening they returned home, not in such spirits as they had left in the morning, but much wiser for their day's trip. They had seen how the other fellow did, had come in contact with him, and talked freely of their methods. No doubt, both were profited, and it is natural to suppose that the next year's fair will show a better exhibit from them than was ever shown by them before.

Now, we have used this illustration to show in only one way the great value of the county fair. And would it not be well, if more of our people manifested this same spirit? After all, it is only by comparison that we determine the merits of this or that thing, and how can we compare the farm products unless there be some sort of a fair or contest? Right here is where the keynote of the situation lies: We should not only encourage our people in their county fairs, but try and create a larger interest. Insist that the fair be representative of the county holding it, and that the prizes offered justify the added expense and trouble in getting out a first-class exhibit. For without some other stimulus, aside from the glory and honor, we can hardly expect every farmer to take a part. Then, when the first prizes have been awarded at the county fairs, the winners should see to it that their exhibits are brought safely together at the State Fair at Nashville.

And, again, we find agricultural contests, such as corn clubs, county

clubs, school clubs, etc., being started in many of our States. This corn club alone has attained an enormous growth within the last year or so, and the good accomplished must be incalculable. Then we find, in our more progressive schools, contests being held annually, when the students bring to the school the products raised at home on the farm.

Each student is supplied with seed to be put in, and also, the rules governing the planting, cultivation, and harvesting of the crop. Thus, all are made to follow one system of planting, etc., and the yields will, of course, run much higher than the old average of the community.

It has been the writer's privilege to oversee two such contests, each having for its products, corn, soy-beans, and Irish potatoes. The prizes awarded were of such a nature as to warrant the most painstaking methods, and the yields recorded, will make many a farmer wonder how such yields could be gotten in his country. It was very noticeable that, in both contests, not a disgruntled person was found after the judging. It was true that several of the parties failed to even win a third prize, but they knew that the judges had awarded the prizes on merit only, and these same members are very anxious now that another such contest be held next year. They feel that they failed through some slight oversight, and they are eager to try the more modern and up-to-date methods.

The influence of these contests is far-reaching, and it is highly probable that we will have several of them next year.

CORN PLUS HAY.

By PENN WORDEN.

On a farm in middle Tennessee, an experiment was worked out this summer that was not only interesting, but proved quite profitable. There was a field in which the owner wanted to put corn. The soil, however, was made up mostly of an old creek bed, and was too thin and gravelly for so heavy a crop. If planted to corn, the most that could be hoped from it would be twenty-five to thirty bushels per acre, and the probabilities were that it would fall short of that.

This is what was done with that field: It was plowed and prepared just as for corn; then it was planted in three-foot rows, alternately a row of corn and a row of mammoth yellow soy-beans. Two corn planters were run side by side, one planting beans, and the other corn. Owing to wet weather, all the cultivation this field received was running over it once with a spring tooth weeder, once with the double shovels, and once with a fourteen-toothed harrow. This was all the attention it received until harvested.

By the time the corn was ready for cutting, the soy-beans were about right to be mowed for hay. In putting this double crop up, first

a row of corn was cut by hand in about the middle of the field; then a mower went through and cut the two rows of beans just adjacent. This gave room for the corn binder, which was driven up one side and down the other, followed closely by a mower, cutting the next row of beans.

When the whole crop was down, the corn was shocked, the hay raked, and cured on curing racks. Considering the soil and lack of attention, the corn was the best that was raised on that farm this year, having uniform, medium-length stalks, and two to three well-developed ears to the plant. The production amounted to twenty-five bushels of corn and about one ton of hay to the acre. Besides this, there were forty-five large shocks of corn left on the field, which were shredded later.

The theory in planting in this manner was simply to give each row of corn six feet of soil to draw from, instead of three; although there were only half as many plants, as much grain was developed as if the field had been planted solid to corn, and a ton of bean hay was thrown in per acre for good measure. It may be that the nodules of nitrogen on the bean roots assisted the corn.

Doubtless this system would be impracticable in good soil on a large acreage, but in the case mentioned, it was a success. One fault with the procedure is that the beans attain such size that they are inclined to be woody. Stock, however, eat these down quite close, and what is left makes a good absorbent for liquid manure and fine fertilizer.

THE NEW INSECTICIDE LAW REQUIRES GUARANTEES.

One of the most important Acts passed by the last Congress of direct bearing to the farmer, the fruitgrower, and the trucker is that known as the Insecticide Act of 1910. After January 1, 1911, this Act goes into effect, and relieves the users of insecticides and fungicides of one of the biggest frauds that has been practised upon the American people. Attention is called to this requirement placed upon the manufacture, sale, and transportation of adulterated and misbranded poisons at this time, for it is very evident that certain firms are planning either to go out of business, after January first, or have decided to handle a different line of goods. Great inducements are made now to buy their preparations at once. My advice is not to buy your spray materials until after the new law goes into effect, unless you are sure of their reliability.

The Law is given in full, and all U. T. FARMER readers interested should reserve it for reference.

An Act For preventing the manufacture, sale, or transportation of adulterated or misbranded Paris greens, lead arsenates, and other insecticides, and also fungicides, and for regulating traffic therein, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That it shall be unlawful for any person to manufacture within any Territory or the District of Columbia any insecticide, Paris green, lead arsenate, or fungicide which is adulterated or misbranded within the meaning of this Act; and any person who shall violate any of the provisions of this section shall be guilty of a misdemeanor, and shall upon conviction thereof, be fined not to exceed two hundred dollars for the first offense, and upon conviction for each subsequent offense be fined not to exceed three hundred dollars, or sentenced to imprisonment for not to exceed one year, or both such fine and imprisonment, in the discretion of the court.

Sec. 2. That the introduction into any State or Territory or the District of Columbia from any other State or Territory or the District of Columbia, or from any foreign country, or shipment to any foreign country, of any insecticide, or Paris green, or lead arsenate, or fungicide which is adulterated or misbranded within the meaning of this Act is hereby prohibited; and any person who shall ship or deliver for shipment from any State or Territory or the District of Columbia to any other State or Territory or the District of Columbia, or to a foreign country, or who shall receive in any State or Territory or the District of Columbia, from any other State or Territory or the District of Columbia, or foreign country, and having so received, shall deliver, in original unbroken packages, for pay or otherwise, or offer to deliver, to any other person, any such article so adulterated or misbranded within the meaning of this Act, or any person who shall sell or offer for sale in the District of Columbia or any Territory of the United States any such adulterated or misbranded insecticide, or Paris green, or lead arsenate, or fungicide, or export or offer to export the same to any foreign country, shall be guilty of a misdemeanor, and for such offense, be fined not exceeding two hundred dollars for the first offense, and upon conviction for each subsequent offense not exceeding three hundred dollars, or be imprisoned not exceeding one year, or both, in the discretion of the court: Provided, That no article shall be deemed misbranded or adulterated within the provisions of this Act when intended for export to any foreign country and prepared or packed according to the specifications or directions of the foreign purchaser; but if said articles shall be in fact sold or offered for sale for domestic use or consumption, then this proviso shall not exempt said article from the operation of any of the other provisions of this Act.

Sec. 3. That the Secretary of the Treasury, the Secretary of Agriculture, and the Secretary of Commerce and Labor shall make uniform rules and regulations for carrying out the provisions of this Act, including the collection and examination of specimens of insecticides, Paris greens, lead arsenates, and fungicides manufactured or offered for sale

in the District of Columbia or in any Territory of the United States, or which shall be offered for sale in unbroken packages in any State other than that in which they shall have been respectively manufactured or produced, or which shall be received from any foreign country or intended for shipment to any foreign country, or which may be submitted for examination by the director of the experiment station of any State, Territory, or the District of Columbia (acting under the direction of the Secretary of Agriculture), or at any domestic or foreign port through which such product is offered for interstate commerce, or for export or import between the United States and any foreign port or country.

Sec. 4. That the examination of specimens of insecticides, Paris greens, lead arsenates, and fungicides shall be made in the Department of Agriculture, by such existing bureau or bureaus as may be directed by the Secretary, for the purpose of determining from such examination whether such articles are adulterated or misbranded within the meaning of this Act; and if it shall appear from any such examination that any of such specimens are adulterated or misbranded within the meaning of this Act, the Secretary of Agriculture shall cause notice thereof to be given to the party from whom such sample was obtained. Any party so notified shall be given an opportunity to be heard, under such rules and regulations as may be prescribed as aforesaid, and if it appears that any of the provisions of this Act have been violated by such party, then the Secretary of Agriculture shall at once certify the facts to the proper United States district attorney, with a copy of the results of the analysis or the examination of such article duly authenticated by the analyst or officer making such examination, under the oath of such officer. After judgment of the court, notice shall be given by publication in such manner as may be prescribed by the rules and regulations aforesaid.

Sec. 5. That it shall be the duty of each district attorney to whom the Secretary of Agriculture shall report any violation of this Act, or to whom any director of experiment station or agent of any State, Territory, or the District of Columbia, under authority of the Secretary of Agriculture, shall present satisfactory evidences of any such violation, to cause appropriate proceedings to be commenced and prosecuted in the proper courts of the United States, without delay, for the enforcement of the penalties as in such case herein provided.

Sec. 6. That the term "insecticide" as used in this Act shall include any substance or mixture of substances intended to be used for preventing,destroying, repelling, or mitigating any insects which may infest vegetation, man or other animals, or households, or be present in any environment whatsoever. The term "Paris green" as used in this Act shall include the product sold in commerce as Paris green and chemically known as the aceto-arsenite of copper. The term "lead arsenate" as used in this Act shall include the product or products sold in commerce as

lead arsenate and consisting chemically of products derived from arsenic acid ($H_3 As O_4$) by replacing one or more hydrogen atoms by lead. That the term "fungicide" as used in this Act shall include any substance or mixture of substances intended to be used for preventing, destroying, repelling, or mitigating any and all fungi that may infest vegetation or be present in any environment whatsoever.

Sec. 7. That for the purpose of this Act an article shall be deemed to be adulterated—

In the case of Paris green: First, if it does not contain at least fifty per centum of arsenious oxide; second, if it contains arsenic in water-soluble forms equivalent to more than three and one-half per centum of arsenious oxide; third, if any substance has been mixed and packed with it so as to reduce or lower or injuriously affect its quality or strength.

In the case of lead arsenate: First, if it contains more than 50 per centum water; second, if it contains total arsenic equivalent to less than twelve and one-half per centum of arsenic oxid (As_2O_5); third, if it contains arsenic in water-soluble forms equivalent to more than seventy-five one-hundredths per centum of arsenic oxid (As_2O_5); fourth, if any substances have been mixed and packed with it so as to reduce, lower, or injuriously affect its quality or strength: Provided, however, That extra water may be added to lead arsenate (as described in this paragraph) if the resulting mixture is labeled lead arsenate and water, the percentage of extra water being plainly and correctly stated on the label.

In the case of insecticides or fungicides, other than Paris green and lead arsenate: 1st, if its strength or purity fall below the professed standard or quality under which it is sold; 2nd, if any substance has been substituted wholly or in part for the article; 3rd, if any valuable constituent of the article has been wholly or in part abstracted; 4th, if it is intended for use on vegetation and shall contain any substance or substances which, although preventing, destroying, repelling, or mitigating insects, shall be injurious to such vegetation when used.

Sec. 8. That the term "misbranded" as used herein shall apply to all insecticides, Paris greens, lead arsenates, or fungicides, or articles which enter into the composition of insecticides or fungicides, the package or label of which shall bear any statement, design, or device regarding such article or the ingredients or substances contained therein which shall be false or misleading in any particular, and to all insecticides, Paris greens, lead arsenates, or fungicides which are falsely branded as to the State, Territory, or country in which they are manufactured or produced.

That for the purpose of this Act an article shall be deemed to be misbranded—

In the case of insecticides, Paris greens, lead arsenates, and fungicides: First, if it be an imitation or offered for sale under the name of

another article; second, if it be labeled or branded so as to deceive or mislead the purchaser, or if the contents of the package as originally put up shall have been removed in whole or in part and other contents shall have been placed in such package; third, if in package form, and the contents are stated in terms of weight or measure, they are not plainly and correctly stated on the outside of the package.

In the case of insecticides (other than Paris greens and lead arsenates) and fungicides: First, if it contains arsenic in any of its combinations or in the elemental form and the total amount of arsenic present (expressed as per centum of metallic arsenic) is not stated on the label; second, if it contains arsenic in any of its combinations or in the elemental form and the amount of arsenic in water-soluble forms (expressed as per centum of metallic arsenic) is not stated on the label; third, if it consists partially or completely of an inert substance or substances which do not prevent, destroy, repel, or mitigate insects or fungi and does not have the names and percentage amounts of each and every one of such inert ingredients plainly and correctly stated on the label: Provided, however, That in lieu of naming and stating the percentage amount of each and every inert ingredient the producer may at his discretion state plainly upon the label the correct names and percentage amounts of each and every ingredient of the insecticide or fungicide having insecticidal or fungicidal properties, and make no mention of the inert ingredients, except in so far as to state the total percentage of inert ingredients present.

Sec. 9. That no dealer shall be prosecuted under the provisions of this Act when he can establish a guaranty signed by the wholesaler, jobber, manufacturer, or other party residing in the United States, from whom he purchased such articles, to the effect that the same is not adulterated or misbranded within the meaning of this Act, designating it. Said guaranty, to afford protection, shall contain the name and address of the party or parties making the sale of such articles to such dealer, and in such case said party or parties shall be amenable to the prosecutions, fines, and other penalties which would atttach in due course to the dealer under the provisions of this Act.

Sec. 10. That any insecticide, Paris green, lead arsenate, or fungicide that is adulterated or misbranded within the meaning of this Act and is being transported from one State, Territory, or District, to another for sale, or, having been transported, remains unloaded, unsold, or in original unbroken packages, or if it be sold or offered for sale in the District of Columbia or any Territory of the United States, or if it be imported from a foreign country for sale, shall be liable to be proceeded against in any district court of the United States within the district wherein the same is found and seized for confiscation by a process of libel for condemnation.

And if such article is condemned as being adulterated or misbranded, within the meaning of this Act, the same shall be disposed of by destruction or sale as the said court may direct, and the proceeds thereof, if sold, less the legal cost and charges, shall be paid into the Treasury of the United States, but such goods shall not be sold in any jurisdiction contrary to the provisions of this Act or the laws of that jurisdiction: Provided, however, That upon the payment of the costs of such libel proceedings and the execution and delivery of a good and sufficient bond to the effect that such articles shall not be sold or otherwise disposed of contrary to the provisions of this Act or the laws of any State, Territory, or District, the court may by order direct that such articles be delivered to the owner thereof. The proceedings of such libel cases shall conform, as near as may be, to the proceedings in admiralty, except that either party may demand trial by jury of any issue of fact joined in any such case, and all such proceedings shall be at the suit of and in the name of the United States.

Sec. 11. That the Secretary of the Treasury shall deliver to the Secretary of Agriculture, upon his request, from time to time, samples of insecticides, Paris greens, lead arsenates, and fungicides which are being imported into the U. S. or offered for import, giving notice thereof to the owner or consignee, who may appear before the Secretary of Agriculture and have the right to introduce testimony; and if it appear from the examination of such samples that any insecticide, or Paris green, or lead arsenate, or fungicide offered to be imported into the United States is adulterated or misbranded within the meaning of this Act, or is otherwise dangerous to the health of the people of the United States, or is of a kind forbidden entry into or forbidden to be sold or restricted in sale in the country in which it is made or from which it is exported, or is otherwise falsely labeled in any respect, the said article shall be refused admission, and the Secretary of the Treasury shall refuse delivery to the consignee and shall cause the destruction of any goods refused delivery which shall not be exported by the consignee within three months from the date of notice of such refusal under such regulations as the Secretary of the Treasury may prescribe: Provided, That the Secretary of the Treasury may deliver to the consignee such goods pending examination and decision in the matter on execution of a penal bond for the amount of the full invoice value of such goods, together with the duty thereon, and on refusal to return such goods for any cause to the custody of the Secretary of the Treasury, when demanded, for the purpose of excluding them from the country, or for any other purpose, said consignee shall forfeit the full amount of the bond: And provided further, That all charges for storage, cartage, and labor on goods which are refused admission or delivery shall be paid by the owner or consignee, and in default of such payment shall constitute a lien against any future importation made by such owner or consignee.

Sec. 12. That the term "Territory," as used in this Act, shall include the District of Alaska and the insular possessions of the United States. The word "person," as used in this Act, shall be construed to import both the plural and the singular, as the case demands, and shall include corporations, companies, societies, and associations. When construing and enforcing the provisions of this Act, the act, omission, or failure of any officer, agent, or other person acting for or employed by any corporation, company, society, or association, within the scope of his employment or office, shall in every case be also deemed to be the act, omission, or failure of such corporation, company, society, or association, as well as that of the other person.

Sec. 13. That this Act shall be known and referred to as "The insecticide Act of 1910."

Sec. 14. That this Act shall be in force and effect from and after the first day of January, nineteen hundred and eleven.

Approved, April 26, 1910.

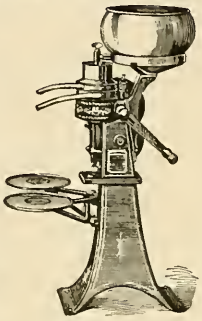
COUNTRY BOYS HAVE THE BETTER CHANCE.

N. J. Spillman, of the United States Department of Agriculture, who was one of the speakers at the Ontario Experimental Union Convention a few years ago, thinks boys raised on the farm have a great advantage over those brought up in the city. In a recent article in support of this view, Mr. Spillman points out that 92 per cent. of the Presidents of the United States were brought up in the country; and that 89.2 per cent. of the State Governors of the Union, 83.9 per cent. of the cabinet officers of the United States, 55.4 per cent. of the railway presidents, 64 per cent. of the members of the House of Representatives, and 70.6 per cent. of the United States Senators were similarly brought up. —Ex.

The poorest farms and the poorest farmers in all the Cotton Belt are where the most money has been spent for commercial fertilizers, with the one idea of making cotton to sell. —Ex.

The day is not far distant when a man will be ashamed to tell you that his land is poor. —Ex.

It is to the barnyard that we must look for the future, and aided by it, we can make the South the greatest farming section of the country. —Ex.



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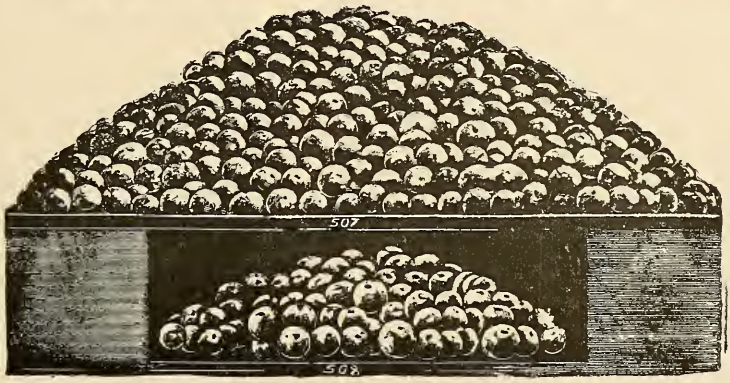

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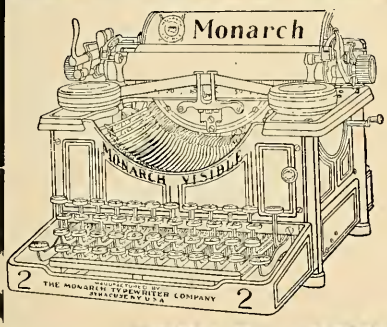

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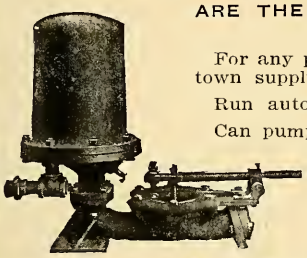

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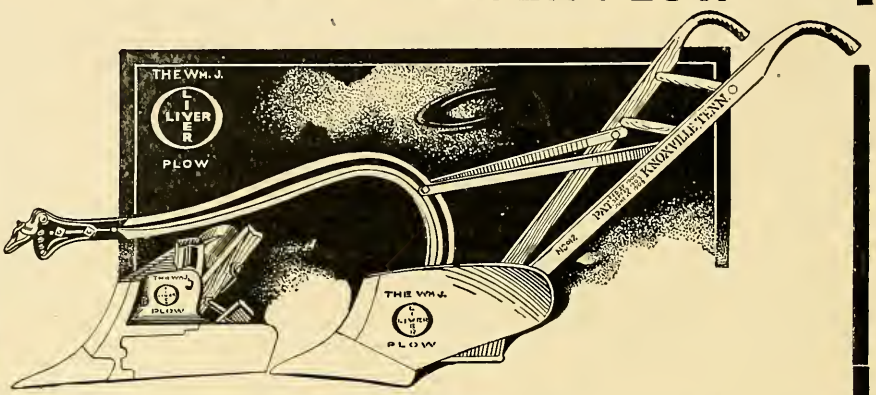

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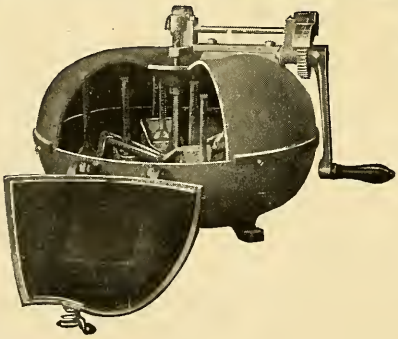

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The True Gentleman

THE TRUE GENTLEMAN is the man whose conduct proceeds from good-will and an acute sense of propriety, and whose self-control is equal to all emergencies; who does not make the poor man conscious of his poverty, the obscure man of his obscurity, or any man of his inferiority or deformity; who is himself humbled if necessity compel him to humble another; who does not flatter wealth, cringe before power, or boast of his own possessions or achievements; who speaks with frankness, but always with sincerity and sympathy, and whose deed follows his word; who thinks of the rights and feelings of others rather than his own; who appears well in any company, and who is at home what he seems to be abroad — a man with whom honor is sacred and virtue safe.

—JOHN WALTER WAYLAND.

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THE U. T. FARMER

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ANGORA GOATS FOR THE SOUTH

By P. W. WORDEN, '13.

Doubtless every intelligent farmer has heard of the Angora goat; perhaps a large majority have seen or even had an opportunity to observe this animal; and yet scarcely one out of a hundred ever gives it the careful consideration that it well deserves. To most men an Angora is merely a goat; a thing to be remembered in connection with vile odors, or perhaps a lodge initiation, or even as the target for the humorous cartoonist, who invariably pictures it as munching a tin can. I believe, however, that it will be a question of only a short time till this impression will be blotted out. The Angora has an important position in modern agriculture, and is rapidly gaining popularity.

It is not claimed that this breed of animal should be found on every farm, nor even on most of them. The farmer of a few acres, who keeps all of his land in a high state of cultivation, who practices the more intensive forms of agriculture, such as fruit growing, truck gardening, and similar lines, has no place for the goat, except, indeed, as a pet; and it would be futile to try to interest such a one in this business. There are, however, in the South, and especially in Tennessee, many farms which include a larger or smaller tract infested with shrubs, briers, bushes, weeds, and small trees, worthless alike for cultivation or grazing. It may be a stony hillside, perhaps a half-cleared pasture that has been allowed to revert to bushes, or it may consist of land too poor to raise anything but weeds and scrub oaks. This is the realm of the Angora goat; here, where no other type of domestic animal could subsist, he thrives, prospers, and multiplies. Here he reigns supreme. Any farmer who has land of this description should give this matter his careful consideration, and see if it would not be profitable for him to raise Angora goats.

Before discussing the many sides to its practical value, it might be well to briefly describe the pure-bred Angora, and give a short synopsis of its origin. The most preferable type of Angora goat, according to E. L. Shaw, in Farmer's Bulletin No. 137, is somewhat smaller than the sheep, weighing at maturity sixty to one hundred pounds. Both males and females have horns, those of the male growing to a length of from 18 to 20 inches, with an upward, outward, backward twist; those of the

female are but half as long, and much finer. Both sexes have bearded chins. The head should be broad, with a wide muzzle. Ears should be fine, silky, and preferably pendent. The body should be broad and round, with well-sprung ribs and level top-line, broad of chest, and short in the legs. The fleece should cover all parts of the body, except inside of the upper part of the legs, and should yield four to six pounds of ten-inch mohair yearly. The ringlets should be definite and well formed; the tighter the twist, the more indication of fine mohair. The fleece is nearly always a pure, lustrous white, and has very little odor.

The Angora is a native of the village of Angora, in Asia Minor. Here they have been bred since ancient Bible times, and till about 1863 it is thought that they were bred on absolutely pure lines, without the introduction of any foreign blood. Soon after the middle of the last century, the universal appearance of looms in Europe created an enormous demand for mohair, and in order to meet this, the breeders, without foresight, crossed their Angoras on the common Kurd goat, thereby producing a larger goat, but a very inferior grade of mohair. This action was so general that it is almost impossible today to obtain a pure-bred Angora. The registered goats in United States, however, have been bred up to meet the different conditions of this country. Today, nearly every State in the Union is producing a fine grade of mohair. So far, no land has been able to show fleeces of such fineness as are to be found in Asia Minor. This quality is, in all probability, a result of the peculiar atmosphere and climate. The conditions to be found in Angora are almost identical to those of East Tennessee and the mountainous districts of Georgia and Alabama. This is the first reason why we should raise Angora goats.

There are two broad, general reasons why a farmer should raise goats: First, because they are a source of income; second, because practically the only expense is the initial investment. Under the head of sources of income and profit, the following are most important: (1) clearing land; (2) mohair; (3) venison; (4) milk; (5) hide and pelt; (6) pets; (7) sheep protection; (8) fertilization.

It is a characteristic habit of the goat to eat leaves, twigs, and tender bark. For a diet of this kind, he will pass up blue grass, alfalfa, or vegetables. Large weeds, thistles, briers, and scrub oaks are pie and cake to this animal. Therefore, possibly the foremost use is that of clearing land. To show the character of their work along this line, a certain farmer in East Tennessee had a twelve-acre grove, which was badly infested with blackberry bushes and other briers. He turned twenty Angoras in on this, and in two years, that jungle-like piece of land was cleared off as smooth as a carpet. Aided by the manure from the goats, a good stand of grass had come up, and the farmer was able to sell his goats, and turn the pasture over to his sheep. On his original investments, this man had the following results: Twelve acres of land

reclaimed; two clippings of mohair, worth $60; $75 worth of venison, and he sold the original flock for practically what he paid for it.

Mohair is the finest of animal fibres. From it are made the most expensive ladies' dress goods and plushes. The value of the mohair depends upon its fineness, length and lustre. The fleece of a three-fourths pure Angora is worth from 25 to 30 cents. The fleece of a seven-eighths pure-bred brings from 50 to 75 cents; while that of a fifteen-sixteenths pure-bred brings from $1 to $2. As high as $43 has been paid for a single fleece, while Northern mohair has brought $6.50 a pound.

The next product to be discussed is the venison. There is no kind of farm animal so dainty in its eating as the Angora goat. He eats only the cleanest, brightest leaves, will drink only the clearest water, and if given an opportunity, will keep his coat clean and odorless. In contrast to other breeds of goats, the Angora has no odor, except in the breeding season. The meat is fine-ground and tender. When allowed to live on bushes, there is a delicate game flavor, closely resembling deer venison, from which it receives its name. If fed on grain, however, an experienced connoisseur could not distinguish it from mutton.

The milk of the Angora, although seldom of large quantity, is of superior quality, being rich in butter fat and protein. On many farms this is the only source of milk.

The hide makes a grade of leather used in book binding, bringing about $2 per hide. If taken when the mohair is about four inches long, the pelt makes a very pretty rug, worth from $4 to $8.

With the possible exception of the horse and the dog, the goat is the most intelligent farm animal. It is naturally of docile temperament, fond of children, and of a playful disposition. These characteristics, together with its natural beauty, make it an ideal pet for the children.

The Angora goat is more courageous than sheep. A few goats in a flock of sheep will often keep a dog at bay until the farmer can arrive, and sometimes will even drive the intruder off.

In concluding this list of profits, attention should again be called to the fact that these animals convert weeds and bushes into a rich fertilizer, enabling land that at one time could scarcely produce weeds, to support a good stand of grass.

As has been before stated, the expense of maintenance is almost nothing. When asked for advice on raising goats, a certain Tennesseean replied, "Get your goats, and the rest is easy." Any kind of a shelter that will keep off rain, and a woven-wire fence, is all the improvements the goats ask; and a little grain and roughage at hard times in the winter will be many times returned by the fat wethers of next fall.

The Angora is here. He has an important place in the agriculture of the South. It is the wise farmer who makes use of him. The Angora has come to stay.

STEER FEEDING EXPERIMENT, 1909 AND 1910.

By JUDD BROOKS, '12.

A very interesting experiment has been carried on with steer feeding at the University Experiment Station for several years. This feeding test is to determine which crop yield will feed the longest, produce the greater returns in the finished meat product, and which crop can be produced at the least cost.

The crops grown in this experiment were corn, soy-beans, and cow-peas. Three acres of clay loam type of soil were measured off on the Station Farm, and seeded to corn, soy-beans, and cow-peas.

In the fall of 1908, the corn acre was seeded to Union barley, 1½ bushels per acre. The manure produced by the four steers fed on the 1908 yield from this acre was returned during the winter of 1908 and 1909. This manure was applied as soon after voided as convenient, in order to lose as little of the liquid content as possible. In March, 1909, the acre was seeded to red clover, 12 pounds to the acre. On June 5, the barley was harvested for grain, and produced 21.5 bushels, or 1,240 pounds of grain. The field was plowed in June, and seeded to corn on June 16, at the rate of 16 pounds per acre, in 40-inch rows. The corn was cultivated well during the growing season. October 4, 1909, the crop was harvested with a corn binder, and shocked in the field. After the shocks were well dried out they were gathered and weighed—the yield was 24 bushels of grain and 2,280 pounds of stover. This was stored away separately, in order to have no trouble in feeding it.

The soy-bean acre was seeded to Union barley, 1½ bushels per acre, in the fall of 1908. The manure produced by the soy-bean-fed steers of the winter of 1908 was added to the acre as voided. In March, 1909, the field was seeded to red clover, 12 pounds to the acre. The barley was harvested June 5, yielding 23 bushels, or 1104 pounds, of grain. The plat was then plowed, prepared well, and seeded to soy-beans, 68 pounds per acre, in 24-inch rows. They were cultivated as the field crops of beans were. On October 9, 1909, the crop was harvested and put on cocks in the field, where they dried. The crop was hauled in, weighed, and threshed with a Koger Pea Separator. The yield was 17 bushels of beans.

The cow-pea acre was also seeded to Union barley, 1½ bushels per acre, in the fall of 1908, and the manure produced by the steers fed on the previous yield of cow-peas and barley was spread during the winter. It was seeded to red clover, 12 pounds per acre, in March, 1909. The barley was harvested June 5, for grain, yielding 31½ bushels of barley. The acre was then prepared and seeded to whippoorwill cow-peas, 63 pounds to an acre, in 24-inch rows. The peas were harvested and placed on racks on September 22, where they dried. The crop was threshed with the above-mentioned pea separator, yielding 6 bushels peas.

The steers, twelve in number, were bought from a lot collected by

D. F. Brown in the vicinity of Knoxville. They were good-grade cattle, some Shorthorns, Herefords, and Angus. They were separated into groups, consisting of the three grades, and one Poll Angus each. Great care was taken in selecting the steers, in order to not give one lot an advantage over another. The steers were fed in the yard on sorghum, which was not dry, and soy-bean stover, in order to bring them gradually to full feed. They consumed from 450 to 670 pounds of sorghum daily, and about 100 to 125 pounds of soy-bean stover, which was given to them every other day. After the cattle had been fed the above ration for 15 days, they were gradually switched, from November 6th to 20th, to the ration to be used in the feeding experiment.

The table below gives the ration made out from the yield of each of the acres used in the experiemnt. This is to be fed in 90 days, consisting of three 30-day periods:

Corn Acre	1st 30 Days	2nd 30 Days	3rd 30 Days.
Corn and cobmeal	3.50 lbs.	4.50 lbs.	6.00 lbs.
Barley	2.25 lbs.	3.50 lbs.	5.00 lbs.
Stover	8.00 lbs.	8.00 lbs.	8.00 lbs.
Silage	20.00 lbs.	20.00 lbs.	20.00 lbs.
Soy-bean Acre.	**1st 30 Days.**	**2nd 30 Days.**	**3rd 30 Days.**
Soy-bean meal	2.00 lbs.	3.00 lbs.	3.50 lbs.
Barley	2.00 lbs.	3.00 lbs.	4.00 lbs.
Barley straw	8.00 lbs.	10.00 lbs.	10.00 lbs.
Silage	20.00 lbs.	20.00 lbs.	20.00 lbs.
Cow-pea Acre	**1st 30 Days.**	**2nd 30 Days.**	**3rd 30 Days.**
Cow-pea meal	1.5 lbs.	1.5 lbs.	
Barley	5.5 lbs.	7.0 lbs.	
Barley straw	8.0 lbs.	10.0 lbs.	
Silage	20.0 lbs.	20.0 lbs.	

On November 20, 1909, the cattle were on full feed. They were weighed on this date, and every ten days during the experiment, and at the end of each 30 days of the 90-day period. The table below shows the weights of the cattle at the beginning and end of each 30 days of the 90-day period; also, the sum total gained during the time fed:

CORN LOT.

No. Steer	Weight Nov. 20,	Wt. end 1st 30 days Nov. 20 to Dec. 20		Wt. end 2d 30 days Dec. 20 to Jan. 20		Wt. end 3rd 30 days Jan. 20 to Feb. 20		Sum total gain for 90 days
	Beginning Experim'nt		Total Gain		Total Gain		Total Gain	
1	1,005	1,067	62	1,107	40	1,153	46	148
2	910	993	23	965	32	1,008	43	48
3	1,075	1,122	47	1,138	16	1,225	87	150
4	1,035	1,070	35	1,050	20	1,115	65	120
Totals	4,025	4,192	167	4,260	168	4,501	241	476
SOY-BEAN LOT.								
5	1,047	1,080	33	1,125	45	1,208	83	161
6	1,040	1,083	43	1,155	72	1,220	65	180
7	932	973	41	1,025	54	1,068	41	136
8	932	995	63	1,022	27	1,087	65	155
Totals	3,951	4,131	180	4,329	198	4,583	754	632
COW-PEA LOT.								
9	955	1,020	65	1,093	73	1,137	44	182
10	1,092	1,170	78	1,232	62	1,280	48	188
11	1,015	1,106	91	1,213	107	1,275	62	260
12	982	1,053	71	1,067	14	1,107	40	125
Totals	4,044	4,349	305	4,605	256	4,799	194	755

The cost of the seed corn, plowing, and preparation of the soil, planting, cultivation, harvesting, storing, and rent of the field, amounts to $14.86 an acre, as given by Tennessee Station Bulletin No. 79. The four steers weighed 4,025 pounds at beginning of the experiment, and cost $4.44 per hundred, or $178.71. The gain for the 90-day period was 476 pounds. This gain, at 5.8 cents a pound, amounts to $27.61. 1230 pounds of barley, worth $10.75; 1680 pounds of corn, worth $18.00; 2,880 pounds of stover, worth $6.64; and 7,200 pounds of silage, worth $6.48, was fed. The ration fed, sold on the market, less the farm value in plant food taken from the soil ($23.60), and cost of production per acre ($14.86) equals $3.40. The steers were sold at a profit of $27.61, and about 70 per cent. of the plant food eaten was returned to the farm in manure, worth $16.52. The profit by feeding is the difference between the farm value of the ration and the farm value of the steers fed. This amounts to $8.95.

The cost of the soy-bean seed, preparation of the land, cultivation, harvesting, storing, and rent of the field amounts to $13.09, as the above mentioned bulletin states. The steers weighed 3,951 pounds at the beginning of the experiment, cost $4.44 per hundred, or $175.42. The gain for the 90 days fed was 632 pounds; this gain, at 5.80 cents a pound, amounts to $36.66. 1104 pounds of barley, worth $9.50; 1,020 pounds of soy-bean meal, worth $34; 2,560 pounds barley straw, worth $2; 7,200 pounds of silage, worth $6.48, was fed. This ration sold on the market, as the corn ration, would amount to $7.22. The 70 per cent. of plant food returned to the soil in the manure is worth $24.92. The nitrogen content of this ration is much larger than in the corn ration. The profit by feeding the crop to the steers amounts to $15.60.

The cost of the cow-pea seed, preparation of the field, planting, cultivation, harvesting, storing, and rent amount to $14.51, as stated in Bulletin No. 79. The steers weighed 4,044 pounds on November 20, at the beginning of the experiment, and cost $4.44 per hundred, or $179.55. The gain for the 60 days that the cow-peas lasted was 561 pounds. The steers were fed the same ration the next 30 days, but from other acres. The total gain for 90 days was 755 pounds, amounting to $43.79; 1,512 pounds barley, worth $13.50; 360 pounds of cow-peas, worth $12.00; 2,160 pounds of barley straw, worth $2; 4,800 pounds of silage, worth $2.25, was fed. The steers were sold for 5.80 cents a pound, and the manure returned to the soil amounted to about $25.61. The profit, by feeding steers on the acre for 90 days, is $19.29, or 60 days for $12.80.

The corn and soy-bean acres fed the 90 days, and the soy-bean acre could have fed even longer. The cow-pea acre fed only 60 days, after which time, as stated above, the experiment was finished out with the same ration, but from other acres. The silage fed in this test was not grown on these acres. The soy-bean acre fed longer, produced more gain, and was grown cheaper than either corn or cow-peas. This compares favorably with the results gotten each of the three years previous.

The soy-bean, also, as well as the cow-pea, does not reduce the fertility as does the corn. It gathers 53 pounds of nitrogen per ton of hay from the air. The many farmers of Tennessee can raise the soy-bean successfully. The climatic conditions are favorable. It can be fed to the live stock, and by so doing, build up the fertility of the soil, and also have in this soy-bean a food equal to the cotton seed in nitrogen content.

RECLAIMING THE SOUTHERN FARM.

By D. C. PARMAN, '11.

At present there is very little virgin land in the South to be put into cultivation; that is, land that will be productive to an economical extent if it should be put under the plow. It is true that there are many acres of virgin soil in the glades and swamps, but this land cannot be reclaimed as economically in most cases as the abandoned Southern farm. There are thousands of acres of abandoned and half-cultivated fields that can be put into a high state of cultivation by the use of a little forethought and good judgment.

Farm management is poor in all of the older States. This may be accounted for by the customs of the old settlers being handed down from generation to generation. The first people that came to this country thought that the land was an inexhaustible bank, from which they could harvest immense crops forever. This thought brought about a haphazard mode of farm management. It is going to be very hard to turn the people living in these sections from their old customs. The change will be brought about in two ways: 1st, the boys and girls are going to college, and the short courses are going into the various sections and bringing in new customs; 2nd, people that have moved from these older sections, who lost the old customs and gathered new ideas, will move back into these districts. This will be done because the land is cheaper than in the newer sections of the country.

Many of the fields in the South have plant food enough to produce immense crops. The trouble is, the soil is not in the right physical condition, and the plant food is not in a form that plants can use. Deep tilage, with a generous supply of humus in the form of manure or heavy green crops turned under, will be very beneficial to most Southern fields. Crop rotation is very useful in bringing the plant food to an available form and putting the soil in a good physical condition.

One of the greatest factors in the reclamation of the Southern farm is the introduction of good animal husbandry, especially in the meat and milk-producing lines. Stock growing keeps practically all of the plant food on the farm, and tends to get the soil in a better physical condition. It does not make much difference what line of animal husbandry a man follows; it is not the line or breed, it seems, that makes the work profit-

able, but the individuals. Every man to his own taste, if his taste is not for the scrub. It is the weeding out of the scrub that will make profitable stock-raising. Because a cow costs a big price, does not keep her from being a scrub. Good animal husbandry consists in finding out the unprofitable animal and eliminating it from the herd and in encouraging the good to do better.

Good roads are doing a good part in helping to build up the Southern farm. There is economy in good roads. If a man can haul two loads of grain to the market in one day, each load being fifty bushels, on a bad road, it seems to be economy when he clubs with his neighbors, gives $75 to build a road that will last at least five years, and then makes three loads of seventy bushels each, per day, thus marketing 2,000 bushels of grain each year. Besides, the farmer has a good drive to town when he wants it. Good roads will help to better the social conditions in the rural districts. They will make the automobile practical in the country, and this will bring the farmers into closer relation.

Marketing the products of the farm is one phase of development that has been neglected in the South. One reason is, that it has not produced a staple product as yet. Economy in marketing is one of the greatest problems that any enterprise has to face. Many manufacturing companies spend as high as 50 per cent. of their net profits in marketing their products. And the ones that do the best marketing are the most successful.

The South is a land of opportunity for the young man with energy and a good business ability. The old Southern farm can be developed more economically than most of the new lands of the West. When one of them is developed, there is a more ready sale for it than for the Western land, as the buyer is always at hand. Make farming a business. Farming is a money-making business, and must be handled as such.

CLEANING UP THE FARM.

By PAUL P. HITE, '13.

Did any man ever stop to think how much waste ground was on his place that could be used to a good advantage? On every farm there are plenty of small patches of briers and bushes along the fence that would raise a couple of bushels of grain, and help the looks of the farm a great deal, if they were cleaned up.

When land sells for a hundred or more dollars an acre, it is too valuable to raise briers and sprouts. If a farmer does not keep his fence-corners cleaned out every year, in a few years weeds will be so thick and large that he can not plough within ten or twelve feet of the fence.

I know of a certain farm, on which the horse-weeds and blackberry bushes are so tall in the summer, that anyone riding along the side of

the fence can not tell what is growing in the field. If the owner of this farm would spend a few days in the summer of each year, after the crops are laid by, cleaning up this fence row, so he could plough it, he would grow enough grain there in one year to pay him many times for his work. While he is making money this way, he is improving the looks and appearance of his place by a large per cent.

Most of the farmers do not have much to do after the crops are laid by, and the wheat is threshed. This is the time to do the cleaning up around the place. All the weeds ought to be mowed off the pastures and wheat stubble, and the fence corners cleaned out. The corner of an old rail-fence is the best place for weeds and bushes to grow, because the corner can not be cleaned except with the hoe or hand scythe, and these are two things that most farmers don't like to use.

I once heard a visitor ask a native of a certain county in this State, who was the best farmer in his county. The man named a certain farmer, and thought that he was the best one, because he kept all the weeds down on his place, and everything around the house and barns was clean and neat. All the fences were kept up in repair, and all the corners free from weeds. The man had ploughed up as close to the fence as a horse could walk, and got some profits from all his ground. I merely mention this for an example, but everybody knows that a farmer's ability to farm is judged by the general appearance of his place.

Nothing makes a person feel better than to take a drive out in the country and see everything along the road clean and well-kept. So let every farmer get busy and clean up his place, and at least help his country that much.

PORK PRODUCTION.

By JEHU L. HINSHAW, '13

At the present prices of pork, hog-raising is one of the most profitable branches of farming. But the farmer who makes a success of it must keep several things in mind. The time has come when he cannot be successful without much care for their feeds and their pens. He must feed wholesome food, and see that his hogs have sanitary quarters. He must also consider the type of hog that suits his conditions best.

When the farmer of today has discarded the lanky, slow-maturing "scrub," that takes two years to weigh from 200 to 300 pounds, and has turned to the pure-bred, quick-maturing hog, he has made a great step toward success in hog-raising. But this in itself is not enough. He must consider his feeds and feeding. The most essential point under this is a good ration, and the more of a ration he can supply through pasture, the better. Good pastures can be had almost the entire year. Clovers, grasses, and annual plants, such as wheat, barley, cow-peas,

soy-beans, rape, etc., can as easily be had as pastures. Alfalfa furnishes one of the very best forage crops. It keeps the hogs in a healthy condition, and its high per cent. of protein makes heavy gains at a low cost.

The Kansas Experiment Station found that alfalfa hay is an important feed, when fed with grain. In the experiment, 7.83 pounds of alfalfa hay and one bushel of Kaffir corn produced 10.88 pounds of pork, while one bushel of Kaffir cornmeal alone produced only 7.48 pounds of pork. This shows the feeding value of alfalfa, in connection with grain. Another experiment shows that one acre produced four tons of alfalfa hay, and this in turn produced 1,600 pounds of pork.

The Missouri Station compares the results from the following feeds in a 102-day test: Cornmeal and blue grass gave a daily gain of .63 pounds; cornmeal and clover gave a daily gain of .77 pounds; cornmeal and alfalfa gave a daily gain of .83 pounds. The cost of the cornmeal and alfalfa per pound gain was 3 cents, and that of the cornmeal and blue grass was 3.96 cents.

Rape sown from July to middle of September furnishes a large amount of grazing for the hogs. Corn, cow-peas, and soy-beans makes an ideal ration for late feeding. Let the hogs harvest it. This will save the cost of harvesting, husking, and feeding, and the manure is left on the ground, where it is most needed.

For winter and spring grazing, a mixture of crimson clover, wheat, oats, and rye will give good results.

The Arkansas Experiment Station found that ¼ acre of Spanish peanuts produced 313 pounds of pork, while the same area of corn produced 109 pounds of pork.

Three hundred and three pounds of pork was made per acre in six weeks on peanut pasture alone.

Corn is often considered the standard feed for hogs. The Wisconsin Experiment Station, in a ten-year test, has shown the value of shelled corn compared with that of cornmeal in connection with other feeds.

In the experiment, 280 pigs of various breeds and cross-breeds were divided equally among the lots securing shelled corn and cornmeal. The amount of feed required to produce 100 pounds of gain varied from 360 to 820 pounds. The poorest gains were from the feeding of shelled corn alone to young pigs. The evil effects were shown in the decrease in thrift, and in appetite, and in slow growth. The best gains were made by feeding corn, wheat middlings, and skimmed milk. The 140 pigs fed shelled corn as principal ration ate 46,736 pounds of corn and 22,590 pounds of wheat middlings, or a total of 69,326 pounds of grain. They gained 13,826 pounds. The 140 pigs fed cornmeal as principal ration ate 50,647 pounds of cornmeal and 24,149 pounds of wheat middlings, or a total of 74,836 pounds of grain. They gained 15,891 pounds. The 140 pigs fed cornmeal ate 5,510 pounds more grain, and made 2,036 pounds more gain, than those fed the corn ration. Those fed the corn ration consumed an average of 501 pounds of grain per 100 pounds gain, while

those fed meal ration consumed 471 pounds of grain per 100 pounds gain. That is, they gained 100 pounds on 30 pounds less of grain. The experiments show that corn, though an important feed, will give the best results when fed in connection with other feeds, and that there is economy in grinding the corn.

Cottonseed meal, though very rich in protein, and good for making heavy gains, has a poisonous effect if fed for any length of time. It can be fed for a few days, and then alternated with some other feed, but there are other feeds that can be fed with greater safety.

The hogs should be furnished with sanitary pens. Give them clean, dry sleeping quarters, that are free from dust. There should be plenty of pure water at hand for the hogs. The pens should be so situated that they are connected with the pastures, so that while the hogs are grazing off one pasture, another pasture is growing. This furnishes a uniform supply of green feed and plenty of exercise.

With these conditions, there is little danger of disease. But if disease should break out among the herd, separate those affected from the rest, and lose no time or means to eradicate the disease.

Prompt action may often save heavy losses.

SOME PLOTS OF TALL OAT GRASS.

By L. R. NEEL, '07.

(From Southern Agriculturist)

On September 13, 1909, I had some clay land plowed. The growth on it was foxtail, Japan clover, crab grass, some blue grass, and various weeds. The land did not turn very well, as it is of a "sticky" nature, so the grass, etc., was not well hid. The disk harrow, the smoothing harrow, and a plank drag were used in making a seed-bed. Before the preparation of the land had been completed, six or eight loads of manure to the acre were applied, and worked into the surface with the harrows.

After a well-pulverized and firm seed-bed had been prepared, the tall oat grass seed was sown at the rate of 42 pounds to the acre, and covered by running shallow with a disk drill. The drill was used because the harrow caught some manure and some trash that was not turned under completely. In one instance, the oat grass was sown alone; in another instance, red clover was sown with it, and in another, alsike clover. Red clover was sown at the rate of 15 pounds. The clovers were sown on the surface. I should have said the date of seeding was September 14.

The grass and clovers came up promptly, and there was a fine stand. But the freezing and thawing during an exceptionally hard winter de-

stroyed many plants. However, after spring weather came, the plants branched and spread until the ground was covered.

On May 22, the plots were cut, and the yields were as follows: Tall oat grass alone, 3,941 pounds of cured hay per acre; tall oat grass and alsike (the stand of alsike was not satisfactory), 3,816 pounds; and tall oat grass and red clover, 4,212 pounds per acre. The second cutting was made July 14, and gave 2,059 pounds of oat grass hay, 2,216 pounds of oat grass and alsike clover, and 3,228 pounds of oat grass and red clover hay. The third cutting, made September 20, gave 644 pounds of tall oat grass hay, 609 pounds of tall oat grass and alsike clover, and 906 pounds of tall oat grass and red clover hay per acre. Total yields were, respectively, 6,444, 6,631, and 8,346, pounds per acre.

Some writers say that stock have to be taught to eat tall oat grass, but this was not the case where the above was grown. As soon as the first crop was cut, a wisp of the tall oat grass was placed before each horse and mule (and they were well-fed animals, too). This was done at night, and by morning each animal had pronounced the new hay (new to him) good enough to eat. All of the hay produced was consumed without any waste. By the 25th of October, the grasses and clover (red clover) had made several inches of growth, so calves were turned on the plots. They show a preference to the new grass, although orchard grass and some blue grass are in the same field.

This account is not given so much as an advertisement for tall oat grass as to show what can be done on ordinary soil (almost poor soil), when reasonable preparation and fertilization are given. The land was plowed six or seven inches deep, and harrowed and "dragged" until there were no clods of any importance, and the land was firm enough so that the mules did not make a very noticeable track. Six or eight tons per acre of stable manure was worked into the surface soil. An abundance of seed was used—some less would have been enough if the freeze had not been so severe. The seed was sown two ways, so that there were no bare spots, and the grass seed was covered shallow and evenly.

In general practice, it would probably be better for the crop of the following year to cut and leave the third crop on the ground, and the calves are now pasturing the fall growth too closely, but I wanted to get weights of the third crop, and to see what the calves would do with the grass.

By giving this sod four to six tons of stable manure this winter, or 200 pounds of high grade acid phosphate and 75 pounds of nitrate of soda, per acre, I will expect a good crop next year. The fact that the calves seem to prefer tall oat grass to orchard grass and blue grass does not prove that it is naturally more palatable; it is a change for them. But it does prove to me that we need have no fear about stock eating tall oat grass pasture and hay.

THE LIMING OF SOILS.

By C. E. ALLRED, '12.

The great interest that is being manifested all over the State in the subject of liming, is a very favorable sign in the agricultural development of Tennessee. From all sections of the State come inquiries touching every phase of the subject, showing that farmers in general are waking up to the fact that their soils need lime.

History of Liming.

Lime was one of the earliest materials used for improving the soil, as is evidenced by the writings of Pliny, Cato, and Varro. It was used (by the Romans) in this way probably two or three hundred years B. C. In England, Germany, France, and other European countries, the application of lime in various forms has been, and still is, practiced extensively. The yield in many sections of these countries has been quadrupled, and the growing of many crops previously impossible has been brought about through the use of lime. Ruffin, a Virginia writer, called attention to the use of lime in America as far back as 1818, in the American Farmer, and later in his well-known work, "Calcareous Manures." The value of lime has been demonstrated in many of the States, notably Pennsylvania, but statistics show that even today probably 99 per cent. of the arable land in the United States has never been limed.

Manurial Action of Lime.

Some lime in the soil is necessary for the growth of the plant, and if it be absent and all other essential plant elements present, the plant cannot develop normally. Its use to the plant is as yet not fully understood, but it neutralizes acids, and probably helps form cellulose and chlorophyl. Plenty of lime tends to make the plant thickset and vigorous, while its scarcity makes them slender and knotty. Lime takes the place of potash in certain chemical compounds which exist in the soils, thus liberating the potash, and placing it at the disposal of the plant. Again, if a soil containing inert phosphate of iron is heavily limed, this phosphate will be changed into a form available to the plant. When soluble potash and phosphate are applied to the soil, they tend to combine with iron and aluminum, if plenty of lime is not present, thus forming compounds not available to the plant; if plenty of lime is present, this transformation is greatly retarded.

Effects of Liming on the Soil.

Many clay soils, especially when wet, are not porous enough, do not allow the water to pass through rapidly enough, and so become water-logged, and the air, which is necessary for the development of the plant roots, is excluded. In times of drought, too, these soils cake

readily. Lime is a remedy for these unfavorable conditions. On the other hand, many sandy soils are benefited by liming, in that, in this case, they are rendered more compact. When the remains of plants decay upon a soil deficient in lime, acidity is liable to occur, which is very noxious to most plants. Liming is an effectual and cheap remedy for this condition. Liming tends to prevent washing, in that it makes the soil more open, so that the water sinks into the soil, instead of rushing off over the surface. By making the soil better aereated, and correcting sourness, liming is beneficial to the growth of the various bacteria in the soil. The work of these bacteria is necessary in the utilization of atmospheric nitrogen, the decomposition of organic matter in the soil, and in the formation of nitrates from the ammonia and nitrogen of organic compounds. Lime also helps decompose mineral matter in the soil.

Forms of Lime.

There are two principal forms of lime available for use over this State. These are burnt lime (calcium oxide), and ground limestone (calcium carbonate). There has been much discussion of the relative values of each form, but experiments have shown that, in general, the ground limestone is best suited to our needs. The only cases where burnt lime is to be recommended is in quickly correcting very rich and acid soils for immediate results; for all the other uses mentioned above, the ground limestone has been found as good, and at the same time is free from many of the harmful effects that attend the application of burnt lime, such as burning out the humus, retarding nitrification, etc. The rock to be ground should contain at least 95 per cent. calcium carbonate to give best results, at least cost, and should be ground so that no particle is larger than ⅛ inch in diameter. Ground rock of this character can be bought in any of the larger cities, at 75 cents to $1.25 per ton. The most economical way, however, is for several farmers to co-operate together and buy a crusher. In this way they can easily produce all the lime needed, at $1.00 per ton, and thus save the freight and haul bills. If samples of the various limestones available for use are sent to the Station here, they will be analyzed and the best ones recommended. Impurities likely to be found in limestone are sand, clay, iron pyrites, carbonaceous matter, phosphorous flint, and magnesia. Of course, the more impurities in the stone, the more must be applied—and it is probably true that a large per cent. of magnesium is harmful to the plants.

Effect of Lime on Plants.

Many plants seem to require a large per cent. of lime in the soil for their best development. These should, of course, have lime applied just before planting. Some common lime-loving (Caciphile) plants are lettuce, beets, onions, cucumbers, cantaloupe, cabbage, peanuts, pepper, turnips, garden pea, bean, tobacco, sorghum, alfalfa, clover (all kinds), barley, wheat, oats, timothy, and blue grass.

Plants but little benefited by liming are corn, millet, rye, potatoes, carrot, and redtop. Plants slightly injured by liming are cotton, tomato, cow-pea, watermelon, Concord grape, peach, apple, pear, blackberry, raspberry, radish, sheep sorrel, and chestnut.

Lime is beneficial in destroying larvae, slugs, and worms in the soil; in preventing "finger and toe" disease and club food in cabbage and turnips, and in preventing a disease of the alfalfa roots. But carbonate of lime in the soils is favorable to the development of scab in Irish potatoes, and so should be applied to them with care.

Soils Needing Lime.

There is a widespread idea that if a soil is derived from limestone rock, it does not need lime; this, however, is very far from the truth, because lime leaches very readily from the soil, and much is taken up by plants. There is scarcely a section of the State which does not need lime. Soils are classified according to lime content as follows:

Very poor, .08 per cent.; poor, .08-.12 per cent.; medium, .12-.20 per cent.; good, .20-.40 per cent.; rich, .40-up per cent.

In Tennessee, it has been found profitable to apply lime to soils belonging to any of the first three classes. Conditions suggesting liming are: (1) On light uplands; (2) on acid soils; (3) when clay soils are too adhesive; (4) when swamp lands are to be cropped; (5) when large amounts of organic matter are to be plowed under; (6) on sandy soils, to make more compact.

As a rule, uplands are more in need of lime than bottoms, because it leaches down and precipitates on the bottoms.

Applying Lime.

It has been found that frequent and light applications of lime give better results than large and infrequent applications. So it is recommended that for the average soil two tons of ground rock, 95 per cent. be applied per acre every six years; or one ton of burnt lime. If soil is very rich or very sour, more may be applied; if very poor, apply less. If burnt lime is applied, it should be put on in the fall, to prevent its injuring the plants. It should be spread on the land just after plowing, and harrowed well into the ground, or applied by means of a lime-spreader or fertilizer attachment to grain drill. It should be borne in mind that the tendency of lime is always downward, so it is not advisable to topdress with lime and turn under, unless a very shallow furrow is turned, say two inches. In a rotation, the lime should be applied just before planting a lime-loving crop of the rotation.

THE VALUE OF HERD RECORDS AND HOW THEY ARE KEPT AT THE UNIVERSITY FARM.

By C. A. HUTTON, '13.

Tennessee needs more and better cows to supply the local demand for dairy products. It has been estimated that Tennessee imports annually from the Northern States about 2,500,000 pounds of butter, worth $750,000. The only way to prevent this, and keep our money at home, is for the farmers of the State to raise more cows and better cows, and in order to raise such cows, it is necessary for the dairy farmer to keep herd records.

During the past three years, the Tennessee Experiment Station and the Dairy Division of the Bureau of Animal Industry, U. S. Department of Agriculture, in co-operation, have sent a man over the State to assist the dairy farmers in keeping records, testing cows, and aiding them in various other ways. By the use of scales, the Babcock test, and record blanks, the cows not paying a good profit were pointed out to their owners. During the first two years, 298 cows were tested. The standard set by the Tennessee Dairy Association is 250 pounds of butter fat per year. Out of the 298 cows tested, only 74 produced over 250 pounds fat. In other words, 224 out of the 298, or over 75 per cent. of the cows tested, were not worth keeping. The best cow made a profit of $86.32 above cost of feed, while the poorest lost $4.55.

The best herd tested consisted of 20 cows, with an average production of 5,974 pounds of milk and 307.5 pounds of butter fat, which, at 30 cents a pound, is worth $92.25 per cow, or $1,845 for the herd. The poorest herd shows an average yield of 4,233 pounds of milk and 177.8 pounds of butter fat, worth $53.34 per cow. There were 37 cows in this herd, which gives a gross income of $1,973.58. The best herd consisted of only about one-half as many cows as the poorest herd, yet made nearly as much profit. Suppose the owner of the poor herd, by selection and breeding, were to bring the production of his herd up to that of the other. Each cow would then produce 129.7 pounds more butter annually, worth $38.91 per cow, and the dairyman would then receive $1,449.91 more from the herd during the year.

And yet some dairymen will say that they have no time for keeping dairy records. The fallacy of such an argument is shown by the example just given. Is not $1,449.91 pretty good pay for a few minutes' work each day?

This difference between good and poor cows is true elsewhere, as well as in Tennessee. In Illinois, for example, one dairyman produced $2,000 worth of milk from 20 cows, or $100 per cow, while a neighbor bestowed twice as much labor, and wasted twice the amount of feed, upon 40 cows, and sold only $1,800 worth of milk, or $45 per cow, barely paying ex-

penses, while the other made a clear profit of over $1,000. Yet the second man said he had no time to "fool away" testing his herd. Instead, he spent all of his time in caring for 40 cows, when he might have made as much profit from 20 cows, with half the labor.

Of course it is not to be understood that the simple keeping of herd records in itself will bring about this reformation, but it must be assisted by the use of a good, pure-bred sire and wise selection of the heifer calves from the best cows. But the herd records are absolutely necessary in determining which are the good and which are the poor cows.

In this connection, it might be of interest to state just how the records are kept of the dairy herd at the University Farm. The milk from each cow is weighed and recorded on a suitable blank at every milking, and a small amount of the milk placed in a bottle containing a little bichromate of potash. The spring balances, milk sheet, and composite bottles are kept in a small room adjoining the stable. The milk sheet is conveniently arranged in a glass-covered frame upon the wall beside the scales. It thus requires very little time for each milker to weigh the milk, record the weight, and take the sample for each of his cows. The following figures show a portion of the milk sheet for October:

Milk Sheet.

COW	1		2		3		4	
OCT.	M	E	M	E	M	E	M	E
1	6.0	6.0	10.3	8.7	15.0	14.0	5.6	5.0
2	6.3	6.0	10.1	9.8	15.8	14.3	6.2	4.6
3	6.0	5.0	10.4	8.8	15.9	16.0	5.8	5.3
4	6.1	5.3	9.6	8.0	15.3	15.0	5.5	5.8
5	6.3	6.5	10.2	9.6	16.0	16.0	5.5	5.2

At the end of the month, the milk yield is added up, a Babcock test made of the composite samples, and the butter fat computed. The total yield is then posted up in a book kept especially for this purpose.

Monthly Report Sheet.

Month	Wt.	Milk	Test	Lbs. Fat	Butter	S. Milk	Rough'	Grain	Cost	N. R.
January	910	419.7	5.4	22.34	25.53	391.4	1131	155	$3.07	1:6.4
February	903	410.1	5.8	23.78	27.17	386.3	1012	140	2.86	1;6.6
March	930	401.2	6.1	24.47	27.96	376.7	1107	155	3.05	1:6.3
December	935	457.5	6.4	29.28	33.83	428.2	1652	279	5.17	1:6.3

At the end of the year the totals for each cow are transferred to a larger book, the pages of which are ruled for a record of 15 consecutive years.

At this time a card index is also made out, showing the comparative rank of each cow in the herd.

Specimen of Card Index.

1909 Report of

VIOLA (Herd No. 4) Rank 1

Average weight	1,161 lbs.
Days in milk	365
Average test	4.08
Pounds milk yielded	10,020.1 lbs.
Pounds butter yielded	474.71 lbs.
Average milk per day	27.4 lbs.
Cost	$65.06
Roughage consumed	16,448 lbs.
Grain consumed	3,679 lbs.
Value of milk	$184.22
Value of butter	142.41
Value of skim-milk	19.22
Profit on milk	119.16
Profit on butter	96.57

A similar record is kept of rations fed, as will be seen from the tables.

Feed Sheet.

COW	1		2		3		4	
OCT.	F	W	F	W	F	W	F	W
1	45	0	45	1	70	2	40	1
2	45	1	45	0	70	3	40	2
3	45	0	45	0	70	0	40	0
4	45	2	45	3	70	1	40	3

The column marked F indicates the amount of roughage fed, while the one marked W shows the amount of waste, or food not eaten. The grain ration is kept on a separate sheet.

This system furnishes a complete record of the cow, from first service to date of disposal, including cost of feed, total production, date of service, date of calving, disposal of calves and cow, etc. It is true that the keeping of such records requires some time, and, for the average farmer, might be modified to suit his particular desires. The important thing is, **keep a record of such a nature that you can tell which are your profitable, and which are your unprofitable, cows.**

EDITORIAL.

The beginning of the year is the time of resolutions. There are many made, but few kept. We, as students and farmers, want to resolve —that we will preach and practice better modes of agriculture in 1911 than we have ever done in the past. We should begin to lay aside the old one-horse and one-crop system, and take up the more modern and economical plan of better tillage and double crops.

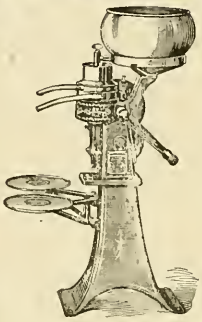
Just as soon as we learn that we can produce two crops cheaper on one acre in one year, than we can two crops on two acres in two years, will we come into the full appreciation of our opportunities, and the valuation of our resources stored in our soils, which can be mined only by the plant, assisted by sunshine, rain, and cultivation.

If there is one thing that we should pay closer attention to than another, it is the selection of the seed which we plant. Select the varieties which are best adapted to the environment, and then work for the best individual results. The crop production can be more greatly increased at a lower cost by the planting of good seed than in any other way.

For one man to breed a corn which will produce only one grain more to the ear, is a matter of small importance in the increase of the crop of a single farmer, but when this is applied to all the ears of corn grown in the United States, it would make an increase in the yield of more than 5,200,000 bushels a year.

Break sod land for the corn crop now!

From all the experiments with the storing of manure, the best results are obtained from the immediate hauling to the field. Either use it as a top dressing on wheat, or put it on the sod land and turn it under. Fall and winter plowing has several good effects: First, it prepares the surface to receive and retain the heavy rainfall of the winter, which is very beneficial to the crop in the dry season. Second, it exposes the winter quarters of many insects which would be very bad on the young corn. Third, the sod is better rotted so that the plant food in the humus is more available. Fourth, the freezes cause the sod to crumble, and improve the physical condition. Fifth, it avoids the rush that might be caused by a wet, backward spring, which would result in overworked stock and improperly prepared seed-bed.



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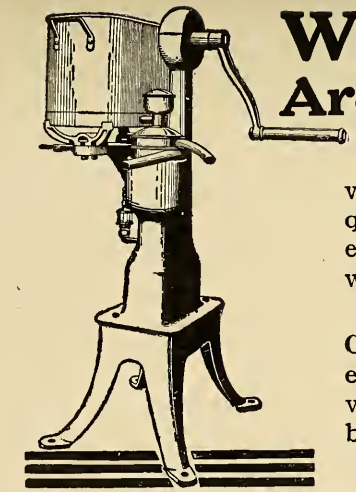

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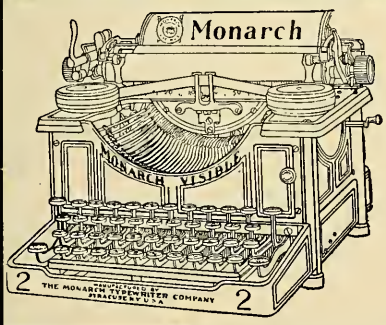

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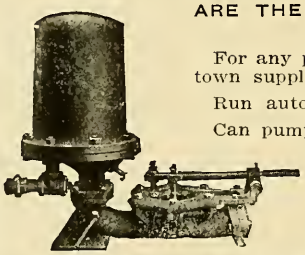

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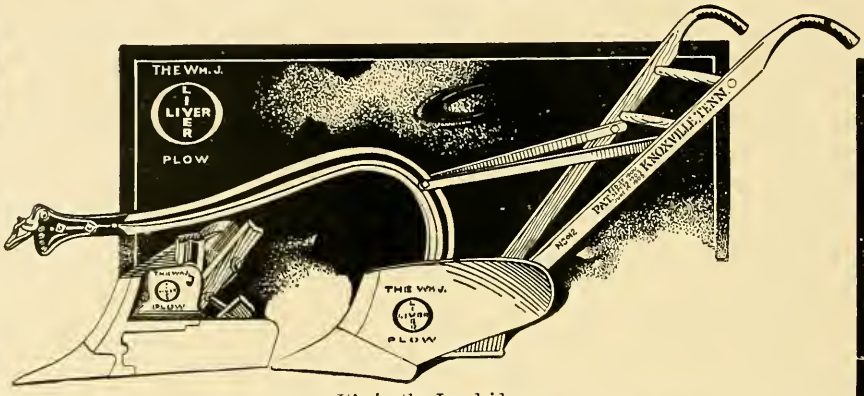

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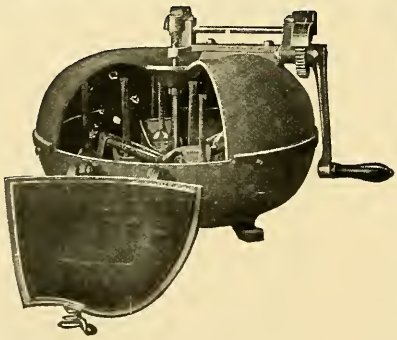

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Vol. V. FEBRUARY 1911 No. 5

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KNOXVILLE

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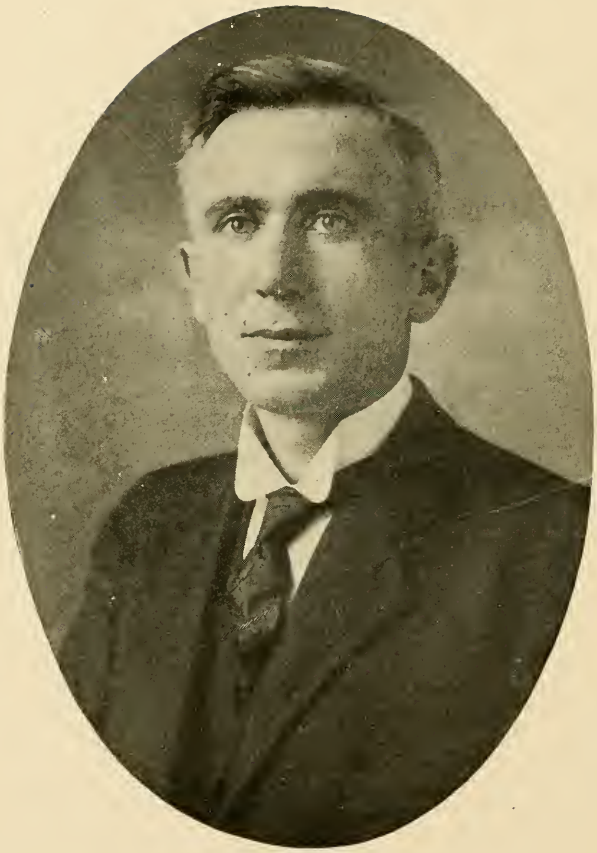

Prof. C. H. LANE

THE U. T. FARMER

Vol. 5. FEBRUARY, 1911 No. 5

A PROFESSOR CHOSEN EDITOR OF THE SOUTHERN FARM ADVOCATE.

After long and diligent search for a man capable to manage a great Agricultural paper, the proprietors of the Southern Farm Advocate have chosen Prof. C. H. Lane, of our university, to fill the editor's chair.

Professor Lane is a man of broad training. After taking the Bachelor of Arts degree from Harvard University, and the Master of Arts degree from Allison University he was elected professor of natural sciences at Washington College. Realizing that in Agriculture there was a greater field to serve humanity, Professor Lane later entered upon and completed a course in agriculture at the University of Tennessee.

For the past three years he has been associated with the agronomy department of our university, where his untiring effort and efficient work has placed him among the foremost as an instructor. His students recognize in him the spirit of the true teacher, ever willing to assist and to give the best of his knowledge to those under him. Every student under him has felt that mental and moral stimulus that comes from personal contact with a well-equipped man of sterling character.

The agricultural students deeply regret the loss of Professor Lane from the University of Tennessee. Realizing, however, that in the position which he is about to assume, his work will be of inestimable value to the farmers of Tennessee. They congratulate the Southern Farm Advocate on securing a man of such unusual training and personality. His frank open countenance at once gains for him friends; while his integrity of character, wide sympathy and optimism easily retain them.

The best wishes of his students and many friends at the university go with him to his new field of work.

CARE OF MANURE.

By C. A. WILLSON, University of Tennessee.

From Dairy Magazine.

It is estimated that the annual production of farm manure in the United States is equal in value to the entire corn crop at $1.05 per bushel, or nearly two and one-half billion of dollars. The most conservative estimate would put the waste of farm manure at one-third,—an annual loss of about $800,000,000. This is about ten times the amount spent annually in this country for commercial fertilizer. There is little wonder then that so much of our soil is becoming unproductive.

The losses which occur with manure are due largely to the carelessness of the owners of the farm. We are inclined to forget that manures

THE WRONG WAY OF PRESERVING MANURE.

have an actual money value and that when we allow them to escape from our possession, down the ravines into the rivers and thence into the ocean, that we are allowing a by-product to leave the farm that has an actual money value. When the year rolls around and it comes time for seeding, we again attempt to feed the soil with commercial fertilizers so that we may obtain a normal yield of corn. It has often seemed to me that the discovery of commercial fertilizers has been a curse instead of a blessing to mankind. It is so easy at seed time to purchase food elements for the plants, that farmers quite generally become careless throughout the remainder of the year in the care of manure. This is one of the most important products of the farm and, indeed, some few farmers consider it

so important that they calculate it as being the chief source of profit in the feeding of some animals.

The value of manure will vary according to the particular class of animals from which it comes, and again, according to the class of food fed each class of animals. The value of manure from various classes of livestock will rank from first to last about in the order given, namely:—poultry, swine, sheep, cattle and horses. The variations in the values of these manures will, upon close study, be seen to be due to the character of each manure, that is whether or not it contains much moisture and bedding, and again, to the character of the feed that has been fed each class. Thus we find that the chief reason for poultry manure being highly valuable is because poultry are fed exclusively upon grains and the manure contains little moisture. The manure from swine is the residue from a grain ration and usually has mixed with it little bedding. Sheep manure owes its high value per ton to its small moisture content, and horse manure owes its comparatively low value to the great amount of bedding which it usually contains and because it is the residue from both grain and hay. Likewise, we should expect the manure from highly fed animals to be much more valuable than from poorly fed animals, for the residue of undigested material from grains should be much more valuable than that from hays and stovers. The manure from a horse for one year is said to be worth approximately $38.81; from a cow $29.27; and from a hog $15.22. It is obvious then that we are dealing with a material that has an actual commercial value. Hence, it should be cared for not according to the easiest method of getting it out of the way, but according to the method which will conserve the greatest amount of its elements.

Since manure has a commercial value we should handle it in a way that will prevent the least losses. It is not uncommon at this and later seasons of the year to see huge piles of manure piled up in the yards to await a more convenient time for hauling or until it becomes literally in the way through accumulations. The losses under ordinary farm-yard conditions are enormous. The Maryland Experiment Station allowed 80 tons of manure to lie in an uncovered pile, exposed to the weather for one year, during which time the amount was reduced to 27 tons. It is safe to assume that from 40 to 50 per cent. of the manurial value of manure may be lost when kept over winter in piles in the yard. The losses from storage occur largely through leaching and fermentation. Had the manure on the Maryland Experiment Station been put upon the ground as soon as made there would have been a saving, with manure at $2.50 per ton, of $132.50,—an item of expense sufficient to pay for hauling upon the ground immediately.

There are three general methods of handling farm-yard manure, namely:

1. Storing in the yards in piles exposed to the weather elements, and hauling out in the spring and fall.

2. Storing under cover and hauling out when convenient.
3. Hauling out and spreading on the ground as soon as made.

The first method is the one most commonly in use, and it is the one that involves the greatest loss. The manure production of a herd of 20 cows will equal 111 tons, and if allowed to be exposed to the weather conditions in the yard would mean a loss of $139.00, if we allow on the basis of the Maryland Experiment Station that 50 per cent. will be lost. It is at least fair to assume that the loss would be from $100 to $125. But there are better methods.

Some might be inclined to think it ridiculous to provide sheds for the storage of manure; but knowing that manure has a commercial value, we can easily see how the investment would pay. Four dollars and eighty cents of the loss represented above would pay interest sufficient to build a manure shed, and leave $95.20 profit each year, that is, it would save that much loss of manure each year.

THE PROPER WAY OF PRESERVING MANURE.

The ideal method of hauling manure from the dairy herd is to haul it from the stall with the manure spreader and spread it on the meadows and fields as made; but as this can not always be accomplished because of the condition of the fields and other kinds of work preventing on certain days, the most practical method is to use an open shed with a cement floor, to prevent waste of liquid manure, and haul as often as arrangement of labor and condition of the ground will permit. This method of hauling manure will save each farmer on the average of $20 to $150 per year. The illustration shows an inexpensive shed used by the Experiment Station of this State. The method of handling the manure is the same as just described, and can be recommended as a great saving in general

farm practice. The first loss in wasted manure is not the only loss entailed by the owner, but with constant losses of manure through poor farm management there is a constant decrease in farm fertility and a lessening of crop production. An old Holland adage has it, "No grass, no stock; no stock, no manure; no manure, no crops."

ON WHAT YEAR'S GROWTH DO APPLE TREES BEAR FRUIT.

By A. S. ADSMOND, '12.

There is an investigation under way on the University fruit farm, to determine on what year's growth the apple fruit spurs are found. Then to see if, by pruning, more of the spurs on young growth can not be saved a few years. This will produce more fruit on older wood, which will result in a better quality, increase the yield and lessen injury from breakage of branches during heavy crops.

The first step in this investigation is to count the fruit spurs on the apple trees as they exist at present, taking each variety by itself because varieties may differ greatly. At this writing the counting of the Winesap variety has been completed and there are some striking results to be noticed, especially with reference to light and the location of fruit spurs on older wood. This counting is accomplished by taking one tree at a time and beginning with the first limb from the root of the tree, numbering it No. 1, and also noting in what direction it stands out from the tree. Then, commencing at the end of the limb, each different year's growth of that limb and its branches is counted separately, so that when the limb is completed the record will show the exact number of fruit spurs on one year old wood, two years old wood, and so on back through each preceding year.

There are two kinds of buds on apple trees, the fruit buds and the leaf buds. These are distinguished from each other by their form. The leaf buds are generally smaller than the fruit buds, and have an angular point, similar to that of a well sharpened pencil. The fruit buds are larger than the leaf buds as a rule, and round at the point, similar to the tip of a well filled ear of corn.

After completing limb No. 1, the second limb from the base is taken, then third limb and so on as they come on the main trunk specifying direction of each from main body until the limbs that point straight up or nearly so, are reached. These are distinguished by North, South, etc., top, as the case may be. When the tree is counted completely the number of fruit spurs on all aged wood is known. Seven years old wood is the oldest wood on which fruit spurs has been found. The trees examined are from eight to twelve years old, and the older wood having spurs on it has always been found on the older trees. From this it can be conjectured that fruit buds might remain on even much older wood if the

sunlight was not shut off from it, thus preventing the destruction of the spurs by natural pruning.

From the thirteen Winesap trees counted the average results are as follows: On one year wood only about 0.16 per cent of the total number of fruit spurs are found; on two year's, 35 per cent.; on 3 year's, 43 per cent.; on 4 year's, 16 per cent.; on 5 year's, 4½ per cent.; on 6 year's 1 per cent.; and on 7 year's growth wood, 0.08 percent is found. We note from these figures that there is only an occasional fruit spur on one year's growth; and this is generally under abnormal conditions. As where the limb has been cut off about the middle of the growing season by blight, lice or by some other incident. Hence the food material which normally would have elongated the branch develops fruit spurs or leaf buds near the end of the limb. The fruit spurs are also very rare on seven year's wood, and can be found only where the branches are open and admit plenty of sunlight into the older growth. This is clearly shown by the considerable increase in spurs on older wood on such sides of the tree as are most exposed to the sun.

In this investigation it is found in the Winesap variety that 42 per cent. of all the spurs in the tops are on two year's growth and also 42 per cent. are on the three year's growth, while on 4 year's wood of the tops it drops down to 11 per cent. This is because the 4 year's wood is shaded by the side branches of the tree. This same percentage is almost repeated on the total spurs of all branches pointing northward.

Now when the total of all branches pointing southward is taken, there is a great difference to be noticed. As, on two year's wood 25 per cent. of the fruit spurs are found while 49 per cent. are found on three year's wood. About 20 per cent. on 4 year's wood, and 5 per cent. on 5 year's wood. From these facts one would be convinced that light is the main problem in getting fruit on older wood of apple trees, but before any definite conclusion is arrived at, other varieties besides the Winesap will be studied in this same way.

TENNESSEE SHOULD BE PRIMARILY A LIVESTOCK STATE.

By JUDD BROOKS, '12.

The livestock farmer is one who feeds his farm produce in the way of grains and hay to the stock and sells nothing from the farm but the finished animal product. While on the other hand, the grain-farmer is one who sells all the crops as grain and hay from the farm.

At present, Tennessee is raising great crops of corn, wheat, cotton, beans, peas, and hay. These crops, together with our mules, cattle, sheep, and hogs are being shipped to the northern feeding sections where the crops are fed to the livestock in order to finish them for the market.

We shall first endeavor to show that the fertility of the soil is being decreased by this system of farming. In the Book of the Rothamstead Experiments, an account is given of corn being grown upon the same

acre of soil for thirty-two years, the crop being removed as in the grain system of farming. The average results gotten for the first eight years of the experiment from 1847 to 1855 were 1205 pounds of grain and 1213.5 pounds of stover. The average results for the second period of eight years from 1855 to 1863 were 535 pounds of grain and 928.5 pounds of stover. The general average for the third eight years from 1863 to 1871 were 142.5 pounds of grain and 786 pounds of stover. The average results of the fourth and last eight years of the experiment from 1871 to 1879 were 120 pounds of grain and 650 pounds of stover. The experiment shows a steady decrease in both the grain and stover yields for each eight-year period of the experiment.

At the Ohio Experiment Station, an account is given of a fifteen year comparison of continuous cropping without manure versus the system in which manure from livestock was used upon the soil. For the first five years of the experiment with corn, the general average of the continuous system was 26.1 bushels of grain per acre, and the general average where the manure was used was 31.9 bushels of grain per acre. The general average for the second five years was 18.4 bushels per acre for the continuous system, and 30.8 for the system where the manure was used. The general average for the last five years was 10.4 bushels per acre for the continuous cropping system and 31.0 bushels per acre for the livestock system.

Prof. C. G. Hopkins of the University of Illinois stated, in the September fourteenth issue of the Breeder's Gazette, that by the old system of farming that is by removing all crops to the market and returning nothing to the soil, many dollars worth of fertility is lost. For example, the average corn crop of Tennessee for the year of 1909, as given in the corn statistics of the 1909 Year Book of Agriculture, is only 22 bushels per acre. This crop, when removed to the market, takes away in nitrogen content of the soil 22.36 pounds, in phosphoric acid 5.06 pounds, in potassium 15.62 pounds, and enough calcium and magnesium to amount to 16.5 pounds of either calcium or magnesium carbonate. To replace these fertilizing constituents by purchase, in the form of a commercial fertilizer would cost $5.95 per acre, and for a crop of 10 acres, it would require $59.40 to replace the fertility removed by the crop. This same 10-acre crop, when fed to livestock, would lose only one-fourth, or $14.85 worth of the fertilizing constituents by being fed. The other three-fourths or $34.55 worth of the fertilizing constituents are returned to the soil in the manure. The cost of the seed corn, preparation of the soil, cultivation, harvesting, storing the crop and the rent of the land amounts to $14.86 per acre, as is given in Tennessee Station Bulletin 79. The amount received for the crop at 70 cents a bushel for the grain and $2.00 per ton for the 6 tons of stover would be $166.00. It would cost $8.00 to market the crop, and $59.40 worth of fertility is taken from the soil. The market value of the crop minus the $67.40 leaves $98.60 the actual amount received for the crop.

Now let us sum up the results by the stockfeeding method of farming. This crop will feed twenty steers for 90 days when supplemented by 200 pounds of silage daily. The steers, if they gain as have the corn fed steers at the Tennessee Station farm,—will gain 2370 pounds or 118 pounds each in the 90 days. These sold on the market at 5.8 cents per pound, as the Tennessee Station Steers were, would bring $137.46 over the original cost. The cost of feeding and the silage used amounts to $20.00. The gain of the steers less the cost of labor, feed, and the $14.85 worth of fertility removed would be $102.61, or a profit of $4.01 over the net profit $98.60 received for the grain sold and furthermore, to this must be added the $34.55 worth of fertility saved on the farm, this making an increase of $37.56 in net profit in favor of the steer feeding process.

Since the fertility of the soil is conserved and more profit is to be made through livestock farming, we, as farmers of Tennessee, should make livestock farming the primary practice.

The conditions are especially favorable in Tennessee for livestock farming. Tennessee has in the middle portion fine grass lands, and in addition are great beds of phosphate, which are being mined and spread over the other sections, making them into fine pastures. We find on investigation that all the farm animals of great value have come from countries having abundance of grass. For example, take the Shorthorns, Polled Durhams, and Herefords; all these come from the grass lands of England. The Aberdeen Augus, and Galloway come from the pastures of Scotland. The Jersey and Guernsey come from the islands for which they are named. Since Tennessee has grass lands and phosphate equal to that of England or Scotland, shall the Tennessee farmer not make use of these advantages?

The climatic conditions of Tennessee are ideal for livestock farming. The average annual temperature, as stated in Tennessee Bulletin 87 is 59° Fahr.; the average date of the first frost is October 20th, and the average date of the latest killing frost in the spring is April 8th. This gives an average growing season of 202 days for the State. These climatic conditions give the Tennessee farmer a great advantage over the Northern farmer. In the North, only one crop can be grown in one season, while on the other hand, it is possible to carry on the double cropping system in the South. For example, the Northern farmer can grow only 40 bushels of oats per acre and the Tennessee farmer can grow not only 50 bushels of oats per acre, but in addition to that, a crop of soy bean hay equal to two tons per acre.

Again the mild winters do not necessitate the building of large barns, for sheds serve equally well. The labor too of tending the livestock is also much less in the milder climate than in the severe winters of the North. The stock in Tennessee can be turned to pasture almost any day during the winter, but the Northern farmer has to keep his stock housed throughout the entire cold season. There are by far fewer losses of

frozen animals in the South than in the North where the snow is on the ground for several months at a time.

If the Northern farmer can grow but one crop annually, has twice the expense for labor, and large barns to build, and can still make profits at livestock farming, why can not the Tennessee farmer, with the favorable conditions, make even larger profits in livestock farming?

Tennessee is favorably located with reference to the markets. The livestock may be sent North to Cincinnati, St. Louis, or Chicago and South to Memphis or Vicksburg and other Southern markets. Tennessee does not have to depend upon any one market. If the livestock cannot be marketed at one place another is always waiting.

Shall the Tennessee farmer continue to rob his soil by shipping his crops, and animals to the Northern farmer to build up his farm; or shall he feed the crops on the farm, thereby making for himself the additional profit and at the same time retaining the fertility of his soil? We advocate livestock farming as the best system for Tennessee. It means greater profits for the individual farmer; more money for the farmer means more money in the State. A richer state should mean better homes, better schools, and a better state.

METHODS OF SKIMMING MILK.

By JOHN R. TITSWORTH, '13.

There are four methods of skimming milk. The oldest way of skimming was by the shallow pan system; the next method was the deep setting or shot gun can system; after that a modification of the deep setting system was developed, called the water dilution system; the last and best method is the centrifugal separator.

Shallow Pan System.

The milk should be placed in pans about twenty inches long and from two to four inches deep. It should be placed in the pans as soon as possible after it is drawn and at a temperature of about 90° F. It should then be cooled to a temperature of about 60° F. and kept at this temperature from twelve to thirty-six hours. The cream is then ready to be removed. This is done with a thin dipper or skimmer.

Deep Setting System.

The deep setting uses the shot gun can to set the milk in. This can is about twenty inches deep and from six to twelve inches in diameter. The milk is put in this can at a temperature of about 90° F and must be rapidly cooled to 40° F. It is kept at this temperature from twelve to twenty-four hours. The cream is then ready to skim off. Some of the cans have a faucet at the bottom so that the skimmed milk can be drawn off leaving the cream.

Water Dilution Method.

The same apparatus is used in this as in the deep setting. This method is used where the temperature can not be lowered to 40° F. The milk is diluted with water and cooled to 55° F. The water may be used in different proportions. Hot water is used in certain cases but then it must be cooled to 40° F.; hot water is used to overcome the difficulty of complete creaming often found in the fall, with cows far advanced in period of lactation.

Centrifugal Separator.

The machine is too complicated to describe but I may be able to tell in a few words how the cream is separated. Centrifugal force is generated in a rapidly revolving bowl and is made to take the place of the force of gravity. The centrifugal force originated in this bowl is so much greater than the force of gravity that the separation is much more complete and is made a great deal quicker.

Efficiency of These Methods.

A class in experimental dairying at the University of Tennessee tested these methods with the following results: By the shallow pan system we found .35 per cent., butter fat left in the skimmed milk; with the deep setting system we found .20 per cent. butter fat left; with the dilution method (milk was diluted with an equal quantity of water having a temperature of 41° F.) we found, .32 per cent., butter fat, and with the centrifugal separator we found .015 per cent. butter fat in the skimmed milk.

We can see from these figures that there was practically twenty times as much fat in the skimmed milk with the shallow pan system as there was in the skimmed milk with the centrifugal separator.

Comparison of Shallow Pan and Centrifugal.

We were then given the following problem: "Suppose a man had a herd of twenty cows averaging 6,000 pounds of milk per year. Determine what would be the loss, with butter at 35 cents per pound if the shallow pan system were used as compared with the centrifugal separators."

.335 per cent. more butter fat is lost by the shallow pan system than by the centrifugal separator. This would mean a loss of 402 pounds of butterfat for the entire time. Allowing one-sixth of a pound over-run per pound of butter fat, this would mean a loss of 469 pounds of finished butter. If this butter is marketed at 35 cents per pound it would mean a loss of $164.15.

Now if we pay $100 for a machine the cost will be approximately $16 a year (provided the machine lasts six years). This would leave a profit of $148.15 through the use of the machine. Aside from the profit, there is the convenience, and time saved in skimming with the centrifugal. It will also give a better quality of skimmed milk to feed the calves and pigs.

LANDSCAPE GARDENING FROM A NURSERYMAN'S POINT OF VIEW.

By A. J. BYRN, Short Course, '10.

The subject of Landscape Gardening has been but little discussed in our Southern meetings; nevertheless we nurserymen are being brought face to face with many planting problems we cannot handle on account of the limited knowledge we have in designing landscape plantings. A home is but half completed when the superstructure is built. What is a home without trees and flowers? A home without trees and flowers is lacking in the refining influence of nature that is characteristic of our typical Southern homes. We are glad to know that more attention is being given to the beautifying of home grounds. A keen interest is being awakened in the minds of many people that the beautifying of home grounds is as necessary as the beautifying of the home itself. We can only hope to give a few principles in the time allotted us here. The first thing necessary is to make a careful study of the location of the house with reference to the outbuildings, walks, drives and the position of all trees, shrubbery and plants to be used should be indicated. Some of the principal objects to be attained in Landscape Gardening is to provide for shade, on the lawns, walks, drives, flowers are arranged so as to obscure unsightly objects and to create vistas to bring into view prominent objects and pleasing scenery. The gardener's art is measured by the degree of success shown in combining the whole to produce a pleasing, graceful and beautiful effect. A small place can often be made to appear larger than it really is by skillfully concealing the boundaries and arrange the plantings so as to carry the eye to objects beyond the boundary. The first plan of a lawn is to produce a restful and inviting effect, and the best material to use is trees and shrubbery. There is nothing more restful than a beautiful lawn of green grass intersperced here and there with inviting shade. A lawn should not be dotted here and there with single specimens of shrubs unless the shrubs seem to be detached from a nearby group, if specimen evergreens or shrubs are desired they should usually be planted near some group of trees or shrubbery. Walks and drives should be as few as possible, next to convenience, grace should be considered. Curved lines are more graceful than straight lines and should be used unless the place is very small and level. Drives should be arranged to give good breadth to the lawn and should never cross it. The heaviest planting should be along the borders of the lawn and extend sparingly into it so the planting will not be too abruptly broken. Trees and shrubs should not be planted in straight lines. In planting shrubbery in groups where different kinds of shrubs are used, the best effect is obtained when several of one kind is planted together not too formally but make each variety seem to run into the

adjoining varieties. The largest growing varieties should be planted in the widest part of the group. No definite rule can be given for planting a place as no two are exactly alike and each place presents a planting problem usually different from other places.

The gardener must be familiar with the habits of the different shrubs used to prevent a conflict of color and a too great discrepancy in the sizes of shrubs used in the same group. Small growing shrubs should usually be planted near the house, a strong growing shrub planted in the L of a house in a group as small shrubs would spoil the effect of the planting.

The progress of Landscape Gardening has been very slow in the South. Is it because the South is not adapted to the growth of trees and flowers? The South is the home of sunshine and the most beautiful flowers found on the globe. Is the nurseryman to blame for the slow progress of this work in the South? The people of the South are not willing to leave the embellishment of their homes to a class of men who know nothing of the principle of combining trees, shrubs and flowers to produce the best effect in planting home grounds. The beauty of a good location is often marred by injudicious planting; a place not so well located is often made beautiful in the hands of a skilled designer. There is a pleasure in growing and associating with trees, plants and flowers that cannot be compared to the value of silver and gold, it can be valued only by the refining influences of nature, breadth of character, noble aspirations and the love for the beautiful instilled in the soul. It is said that 85 per cent of our bankers and leading business men come from the country. They were reared close to nature's heart. We believe the mental and moral successes or failures in life are due more to the early environment of the child than to any other cause. The time was when the South abounded in natural beauty; but the ax of commerce is turning the beauty of our landscape into bleak fields. We are adding to our acres of cereals, cotton and forage. All these are necessary to clothe and feed the body; but we are giving too little attention to the aesthetic side of life. Did you ever go into the woods in June and see the scamper of the squirrel, hear the song of the birds, and feel the bracing influences of the breezes ladened with the perfumes of wild flowers? We deplore the day when these hallowed influences are no longer available. Silver and gold may buy diamonds to adorn the person of the uncooth; but it will not buy refinement; silver and gold are alright; but if you would have your children get the most out of life, adorn your home, make it beautiful and if they ever leave it they will look back to the old home with hallowed memories.

PREPARATION AND SOWING THE PLANT BED OF TOBACCO.

By RUFUS H. FELTS, Jr., '12.

Doubtless to the farmers of Middle Tennessee; especially of Robertson, Montgomery, and Cheatham Counties; and Southern Kentucky there is no more important line of work just now than the preparation for the crop of tobacco for this year. With the bright, clear days of January and February the farmer is busily engaged in burning and sowing plant beds.

Among the first considerations however is the condition of the land and the selection of the place for the bed. The ground must be fairly dry for if it contains a very large amount of water it only boils and the burning process is not complete, or effective. In the selection of the place for a bed there are at least two very important features to be taken into consideration. The first of these is that the site be sheltered by a body of timber, and the second is that it be on a southern or eastern slope so that it will protect it from the cold to some extent, and being on a slope it is sure to have a good supply of sunlight and be well drained.

The soil usually selected is very rich, and better, virgin soil. One of the most popular methods is to clear away an old brier thicket and pile the bed there. However that makes a lot of work necessary to clean the bed of rocks, grubs, etc., but this kind of soil is known to produce superior plants. The beds usually contain 50 or 100 square yards.

After the site is selected then it must be cleared of all briers and bushes, and if any stumps are present they are usually chopped down so as not to interfere with the piling of the bed or with the canvas when it is put on.

The beds may either be burned with brush or covered with sticks of wood, or if there is an old cabin on the farm the logs make good material for plantbeds when split. The farmer always saves the brush when he cuts timber for heating or cooking purposes, or when it is to be sawed into lumber. Then, too, the old fences, if there are any on the farm, must be repaired each year and the old rails may well be used for such a purpose. They are placed in layers, close together over the area marked out for the bed, and then a second layer is put on across the first. The heat from the burning of this material is sufficient to kill most of the seeds of wild plants, and also destroy the injurious insects present in the soil.

Probably the most satisfactory time of the day to burn the bed is late in the afternoon or at night. When this is done the ashes and soil are well cooled by next morning and the farmer is able to proceed with the preparation for seeding. When the wood is all burned and the coals and ashes have cooled the charcoal is raked off of the bed, the ashes being left on the bed, and the soil is ploughed or digged up as

deeply as possible. Now all plant roots must be pulled out and the clods broken, in fact the soil is put into the best possible mechanical condition. Care must also be taken to have all parts of the bed as nearly level as possible, because if low places are left water will stand in these and the young plants will be killed.

The seedbed being prepared the next step is, of course, to sow the seed. For a bed containing 50 square yards, a tablespoon level full, and for a bed containing 100 square yards, a tablespoon heaping full of seed are sown, being mixed with ashes, bonemeal, nitrate of soda, or some other form of fertilizer, according to the quickness of growth desired. Usually about two to three quarts of the material with which the seed are mixed is used, depending upon the amount desired to be sown and the size of the bed itself. The bed should be carefully marked off into squares about three feet each way and the seed and fertilizer are sown broadcast.

After the seed are sown, the soil should be rolled or tramped with the feet to check the rapid loss of moisture and also prevents the seeds being blown away.

Within a few days after seeding, before the seeds germinate, the bed must be covered with canvas, a material made specially for the purpose, to protect the young plants from frost.

The number of acres of land that can be set from any bed will depend, of course, upon the evenness of seeding and the growth of the plants, however, an average bed of 50 square yards will furnish plants for three or four acres of land, counting 3,500 plants to one acre. The plants are usually large enough to be transplanted by May. A height of six to eight inches being most desirable, and from the first to the fifteenth of the month is considered the best time to set young plants.

When the crop of tobacco is set then the work of the farmer has just begun. About 14 to 16 months from the time of sowing the seed is required to raise the crop and prepare it for the market.

A GOOD TIME TO LIVE

One of the pathetic things about the agricultural revolution now going on in the South is to find an old farmer who has lived his life out under less favorable conditions and regrets that he cannot see the splendid development now begun. An exchange quotes an old farmer as saying:

"I wish I could live to enjoy the development that modern scientific methods of farming will bring to this country within the next decade, but I am too old to enjoy much of it. Why, there is a young man in my neighborhood who will make, this year, as much corn on one acre of ground as his father made on a twohorse farm, and he is doing it in sandy soil—the kind that was formerly considered as not being adapted to corn."

Truly the young men of this day, when they compare their conditions with those that their fathers had to meet, should be profoundly thankful.—Ex.

THE GERMINATING BOX FOR TESTING SEED CORN.

By W. K. TIPTON

The germination box is becoming more or less familiar to the most of us. It is a box from three to six inches deep and of such size as can be easily handled about the kitchen or sitting room or in the green house. The box is filled about three inches with wet sawdust or white sand. A piece of white muslin which has been marked off in two-inch squares is stretched over the sawdust. The ears of corn are placed in a row on a table—better where they will not have to be moved until the test is completed—or quite a convenient way is to take a thin soft board and drive 8 or 10-penny nails through it and stick the nails in the pith of the cob. Each ear is numbered and the squares on the cloth are numbered. Now take up the ear with tip pointing towards you and with a pocket knife remove six grains from different parts of the ear. Place the grains in the square corresponding with the number of the ear with the germs up. When the box has been filled spread over it a damp cloth and place in a warm place. After four or five days remove the cloth carefully, so as not to remove any of the seed examine each carefully and those that have not germinated or show signs of weakness, the ears corresponding are discarded.

If sand is used the box can be marked off in squares with small wire or wrapping twine fastened to tacks driven into the sides and ends of the box. The grains are pushed into the sand with the fingers, with the germs up and covered from one half to one inch deep. The sand is kept moist. As soon as the sprouts come through the sand, from one-half to one inch high they are pulled up one at a time. If any of the grains have failed to germinate the ear corresponding to that check is discarded.

These germinating tests can be made in February and March with little loss of time which could be spent profitably doing outside work.

MAINTAINING SOIL FERTILITY.

By D. A. RUSSELL, (Special)

One thing to be regretted in our Tennessee agriculture is the existing warefare against soil fertility. Year after year tons of vegetable matter containing valuable fertilizing elements are shipped from Tennessee soils, never to be returned. This rapid departure of farm crops is due partly to the Tennessee spirit, a desire to act the pig with the soil and get the fruits regardless of the future. The large production of corn, wheat, and oats is justifiable, but its transportation to other lands to be fed is not a sign of prosperity for the present or the future. The continual shipping of grains out of Tennessee will in a course of time result in a lamentable deterioration of the soil. It is bound to come sooner or later unless we put something back on the soil. The practice of selling corn, hay and other farm crops from the soil results not only in a gradual, but constant loss of fertility. It costs no more to till soil that will produce fifty bushels of corn than it does soil that will produce but twenty bushels. Here is one of the fundamental principles in farming, and one of the strongest arguments in favor for livestock farming. The feeding of farm animals means that 85 to 90 per cent. of the fertilizing value of the crop fed can be turned back to the soil from which it came. Livestock farming makes it possible for the farmer to grow a variety of crops, such as alfalfa, clover, cowpeas, and soybeans; and these forage crops should accompany the feeding of corn, oats and cotton seed meal. These forage crops draw from the air, and deposit in the soil more nitrogen than is sold from the farm in the form of meats or milk products. The effect of livestock on a farm is building up rather than tearing down. Livestock farming makes a home market for the crops produced on the farm. Feeding livestock is a means of reducing the crops of the farm to about one-eighth of their original weight. Seven pounds out of every eight is marketed back on the farm; thus reducing the freight 87½ per cent. and saving the hauling of 87½ per cent. to the local market or shipping station. Along with the grain there is produced a large quantity of coarse forage such as corn stalks, straw, etc. Such forage does not always find a ready market, because of its bulky nature, therefore it is left to waste or to be burned in the field if there is no live stock kept to consume it. The profits of a farm is greatly increased by keeping stock which will consume at least a part of this roughness. Another point to be considered in connection to livestock farming is the fact that it distributes labor throughout the year. And last of all comes the source of enjoyments. What can give a farmer more joy than looking upon a choice heard of black and white spotted Holstein Friesian cows grazing upon a fresh green meadow, or a flock of Southern sheep grazing upon a hillside?

EDITORIAL.

SEED GRAIN SUGGESTIONS

Have you any choice seed grain for sale, or will you need seed?

If you have any good seed grain, you should send a sample to your State Experiment Station, stating how much you have and the price you want for it. Your name will be listed and sent to those who ask for good seed.

If you need good seed, the State Experiment Station will tell you where to get it and what it will cost.

If you produce your own seed grain, it is important to select it early out of the best part of the crop and take good care of it.

You should never fail to use a good fanning mill, selecting only the heaviest and plumpest kernels of good body for sowing, and avoid planting shriveled and dwarfed kernels. Wheat, oats, barley and rye seed may be best prepared by fanning mills, which separate by size and by weight, by means of screens and wind blast. A good fanning mill, properly used, will more than pay for itself in a single season.

If your seed appears to be mixed or falling off in yield, it will pay you to get pure bred seed of the best strain adapted to your soil and climate. If you have any doubt as to what varieties to plant, write the State Experiment Station and ask them which will do best in your soil and climate.

Are you testing your seed for germinating qualities? It is a simple matter, and the State Experiment Station will send you full directions for doing it at home.

Do not waste your time in sowing new varieties (except on a small tract as an experiment) unless your State Experiment Station recommends them. You cannot afford to take the chances. Let the Experiment Station do the testing of new varieties and learn the results from them.

Whenever smut appears, treat the seed grain with formalin solution. Get the formula and method from the State Experiment Station. The treatment is very simple and effective.

By attention to these rules, you can increase your crop from 4 to 10 bushels per acre, with very little extra expense. Additional attention to cultural methods and soil fertilization will add further to the profits.

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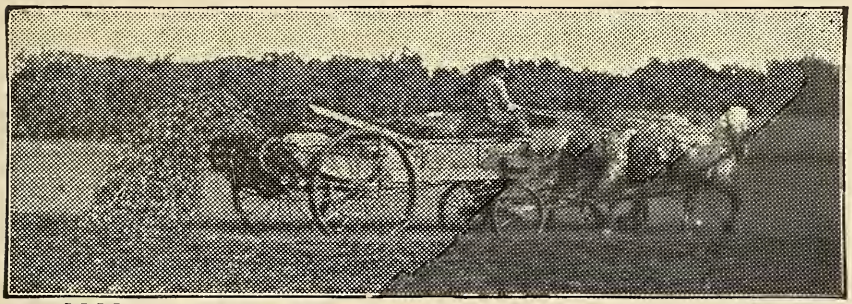

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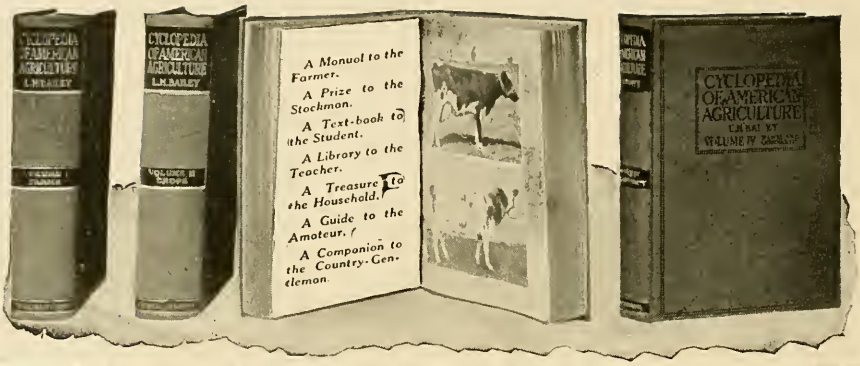

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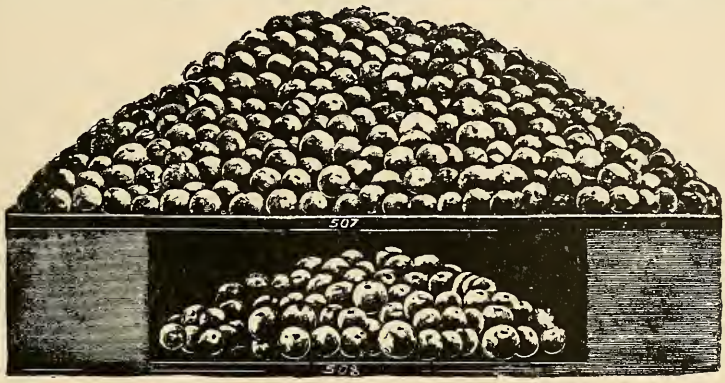

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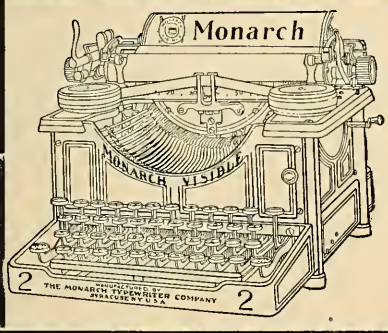

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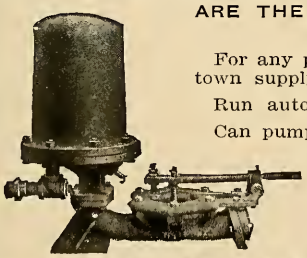

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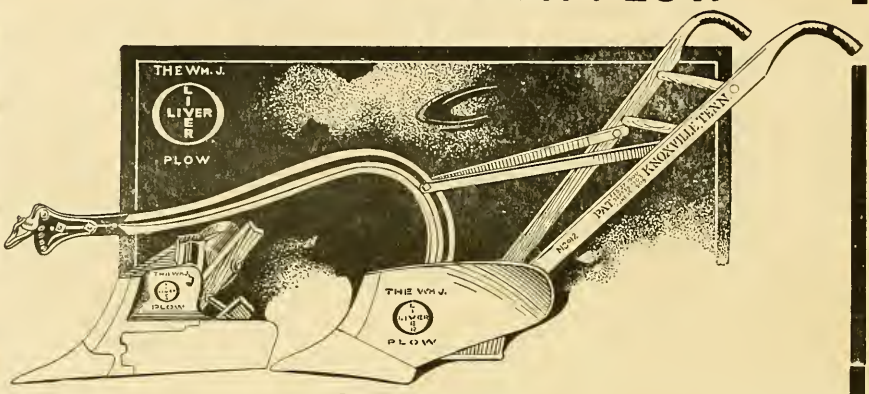

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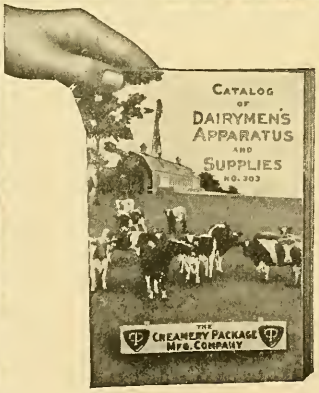

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Vol. V. MARCH 1911 No. 6

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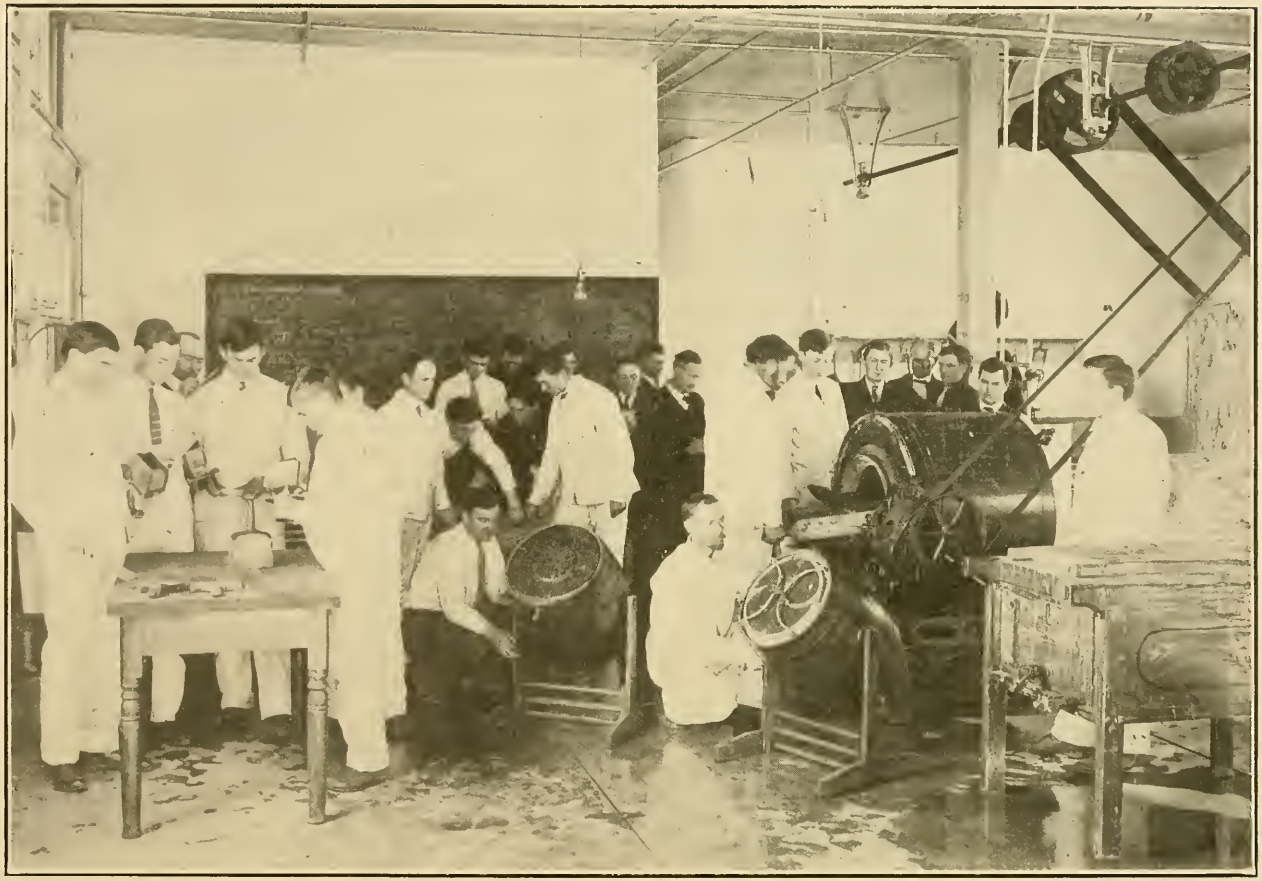

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THE U. T. FARMER

Vol. 5. MARCH, 1911 No. 6

WINTER EGG PRODUCTION.

By VICTOR D. CANEDAY, Short Course, '11.

The majority of poultry keepers, keep poultry principally for egg production, and as the price of eggs is usually highest during the months of November, December and January it follows without question that the man or woman who keeps their flock producing well during these months will make the largest profits.

Winter egg production is not at all difficult to achieve, if the layers are given intelligent care and fed properly. This subject may seem to some unreasonable at this time, but in the writer's judgment this is a most opportune time for its consideration for two reasons: First if the reader has to a considerable degree made a failure of winter egg production the past winter, and finds himself with a flock that has just come into full lay, about the time the prices of eggs have dropped to the low water mark, he will be interested to know how he can have his hens produce for him when the prices are high, and second if he is not a "quitter" but has determined to find out how to have the birds deliver the goods at the right time, he will have to get busy at once, and begin preparations for his egg supply for next November, December and January. To produce winter eggs we must have early hatched pullets. Pullets hatched from March 15th to April 15th if of the general purpose breeds, or a little later for the smaller varieties. These pullets should be the descendants of prolific layers of known heavy producers, if best results are to be expected, and should be carefully reared to keep them growing rapidly from the day they kick themselves free from the confining walls of their little egg shell cradle, until they reach maturity and are ready to begin to reward us for our trouble with fresh laid eggs in the fall and winter, when the other fellows flock in on a strike. Pullets intended for winter egg production must be fed an egg producing ration as they near maturity. For best results growing pullets should be kept on free range, and if the surplus cockerels are sold off early in the summer, when they will bring nearly or quite as much as they would later in the fall when the market is usually overstocked, it will be a great advantage in the development of the pullets as winter layers, and the keeper can better afford to feed the pullets for egg production when by themselves. Animal food of some kind should be fed, as insects become scarcer in the fall. Fresh cut green bone when easily available is the

best, or commercial beef scraps, but where plenty of skim milk can be had as on most farms, the others are not essential. In this climate, winter forage crops, of the clovers or cereals can be grown to provide green food for the layers all winter, and this fact coupled with the fact that the climate here, permits the flock being in the open air nearly all winter and that poultry generally does so much better here than in the states farther South, should make Tennessee one of the greatest producers of winter eggs of any state in the Union.

Fresh, pure water and lots of it, is an essential winter or summer, and in cold weather; results might warrant extra care in adding enough warm water to take the chill off. Good, heavy, plump whole oats is the best egg producing grain we have, and can be fed heavily without danger of over-fattening the hens as it is a non-fattening food. Other grains should be fed for variety. All whole grain should be scattered in straw or litter of some kind so the hens will have to work for all they get. The more they work the more eggs we will get providing we supply enough food for them to dig out to manufacture the eggs from. There are three things we never want our fowls to work to get, because we never can get them to consume too much of them and those are, green food, pure water and sharp grit.

The two most common reasons for failure in winter egg production are: Underfeeding of non-fattening foods and leaving the layers unprotected from sudden changes in temperature. We cannot expect a hen to produce eggs in the winter contrary to her nature when we are only feeding her sufficient to maintain her body in normal flesh, or when we are feeding her foods that are natural fat producers. The poultryman who feeds right and feeds liberally is the man who makes the money. Contrary to the common belief, cold weather does not stop egg production. I have known flocks of hens to produce eggs all winter when kept right out in open sheds in temperature way below zero. While a neighboring flock kept in a glass front house were non-producers all winter and were no comparison to the others in vigor the next spring. A glass front poultry house is about the worst thing possible in the hands of a careless poultry keeper, because it gets too warm in the daytime, and then cools off so rapidly at night that fowls are chilled. A sudden change in temperature is what does the damage and stops our hens laying in the winter. Exposure to heavy winds with a falling temperature is a pretty sure indication in the winter of a drop in egg production and a rise in the price of eggs.

In conclusion, hatch your pullets early, keep them growing from the start to maturity, feed liberally, the proper foods and keep them comfortable by protecting them from disagreeable weather and sudden changes of temperature and keep them healthy, by compelling them to exercise, and next winter you can sell eggs at top prices through November, December and January. The cream of the profit is in winter egg production.

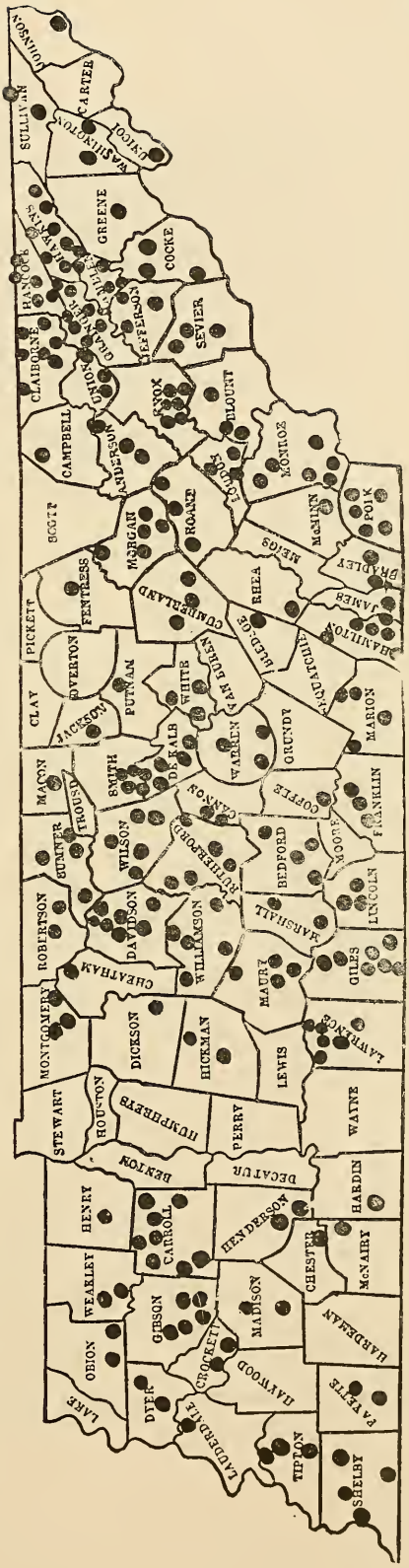
COMMERCIAL APPLE GROWING FROM THE NURSERYMAN'S STANDPOINT.

(By William P. Stark, Louisiana, Missouri, member of the Missouri State Board of Horticulture, and president of the American Association of Nurserymen, read before the Tennessee Nurserymen's association meeting January 27, 1911.)

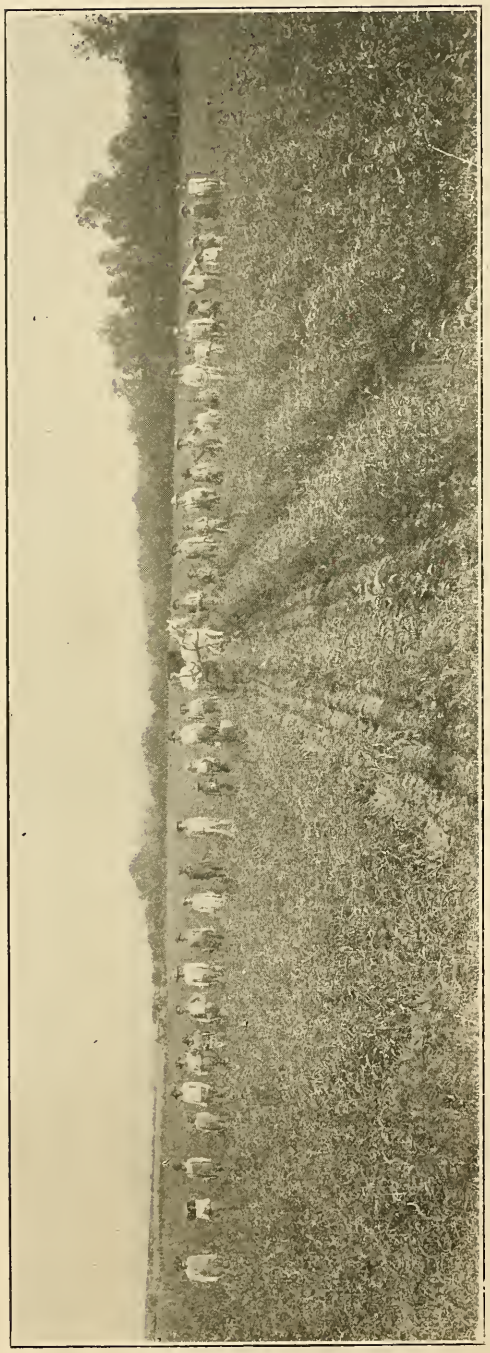
Your esteemed secretary has asked that we discuss two different subjects in this paper and we will give them under seperate headings.

Commercial apple growing depends on many conditions within our control, as well as upon land and climate. Tennessee's great opportunity is at hand today as never before. The "Back to the Soil" movement is drawing a steady stream of the cities' men and women as well as the cities' gold to the favored producing section of the country. Only a few years ago there was a mad ruch to the city, a greed for the city life, but time has brought a re-adjustment—the people are anxious to return to nature and to such people no country appeals more strongly than the mountains and valleys of the more tempered regions of the south.

Every agricultural section has had its share of this new development but the south because of its great setback half a century ago, and the following period of inactivity, now offers the greatest opportunities to the incoming settler as well as to the native born. A wonderful store of opportunities have been allowed to lie dormant for lack of capital



MAP NO. 1. DOTS SHOW LOCATION OF ORCHARDS OF 10 ACRES AND ABOVE IN THE COUNTIES OF THE STATE



ONE OF TENNESSEE'S 800-ACRE NURSERIES, WINCHESTER, TENN.

and men with the interest to develop it.

Tennessee is peculiarly and favorably situated as to soil and climate; and great as your fruit growing interests are, the industry is in its infancy. The apples of Tennessee were renowned in the days of Andrew Jackson, in the days of the stage coach, because wherever the pioneers went, they carried with them the trees and seeds.

Missouri horticulture is indebted to the pioneers of Tennessee and Kentucky for a first start in fruit growing. Personally, I speak advisedly and I may say with pardonable pride, because my two grandfathers were Missouri pioneers going from Kentucky and Tennessee after fighting with Jackson in the New Orleans campaign.

* * *

Great as has been the success of Tennessee today, yet greater is the future in store. You have made just a beginning. Unfortunately the time was, when the average farmer thought there was nothing to do but plant the trees and nature would do the rest. In days gone by nature was most generous but conditions have changed and success comes to him who

not only plants but sprays, cultivates, and keeps in touch with the scientific and practical organizations of the state, and profits from the experience of other successful fruit growers.

The slipshod method must go and the man who is not up to date in his methods had far better cut down his trees, otherwise he is a menace and detriment to his neighbors. An orchardist should not plant more than he can cultivate properly; ten, twenty or fifty acres well cared for will prove far more profitable than a hundred not given thorough work.

Only a few years ago there was a mad desire to count orchard trees by the tens of thousands, the ambition being to secure the largest acreage. Many such orchards were a disaster, a monumental failure. The successful orchard, the profitable one, is based on quality rather than quantity.

Tennessee, on the map, is long drawn out, so to speak, and the adjacent and surrounding market is capable of vast consumption, to say nothing of the more distant markets. Some improvements are necessary—increased plantings, associations for the profitable handling of crops and more varieties—not all Elberta. The early varieties in the more southern parts of the state should be planted. There are many varieties hardier than Elberta, and others can be developed to meet conditions and requirements.

There is much that might be said in favor of pear growing, more attention should be given to pears. The plums of Tennessee are becoming a profitable crop. Cherries are being grown also with profit, and they offer an opportunity which has not been fully appreciated.

* * *

The commercial apple has undoubtedly the greatest future. There are fruit markets to supply in every direction, and

A BRADLEY COUNTY PEACH ORCHARD, CLEVELAND, TENN.

like Arkansas, much of the product may be marketed before you meet the competition of the far west. Tennessee is famed for the Winesap family, which includes the Paragon, Gilbert, Stayman and old Winesap. York Imperial will equal those of Virginia, Grimes' Golden is perfection with you, and there are other varieties commanding more pronounced attention. There is a place for your Jonathan, just as there is a place for your Wealthy, along with the Delicious, King David, Black Ben, and others.

To emphasize the importance of growing early varieties of apples, I will quote Mr. Manville, Idaho's noted orchardist, who said the greatest opportunity he knew anything of, was growing early apples in Illinois and southward, where they had the cheap lands, cheap freights, no irrigation, cheap labor, etc. The early apples should be grown by the car loads, the train loads, just as Georgia grows Elberta peaches. The Liveland raspberry, Yellow Transparent, Wilson Red June, Early Melon, Duchess, Wealthy, etc., should be planted by the tens and hundreds of acres. In this the South has but little or no competition. (Liveland raspberry is a vastly improved Transparent, less blight, more beautiful, having a rich red stripe, and a more productive apple of the Transparent season.)

A long time ago, when oranges were considered a luxury, the statement was made that possibly in time apples would command as high price as oranges. Of late years they have been outselling oranges. Recently Kunze's noted fruit store of Chicago sold the Delicious at $5 per dozen for fancy specimens, and the Stayman Winesap, which you grow to such perfection, at about the same price. Does the price amaze you? If so, we might remind you of some of the sales of fancy Tennessee apples and the high prices commanded by your early varieties. Washington County, Arkansas, orchardists have received as high as $16 per barrel for Wilson Red June, and $14.20 per barrel for Red Bird Peach. However, you understand that extreme high prices are not best for the growers, nor best for the consumers. Let it be a "live and let live" policy. Orchard production today should be far more than 100,000,000 barrels, and then the average family would be scarcely half supplied with this health-giving fruit.

To produce more and better fruit it is necessary that the industry as it exists today in your state be revolutionized. I may say that Professors Bentley, Keffer and others have already brought about a vast amount of good, but the men who are taking the lead need more support. They need the backing of others who are interested, men who will attend the meetings and represent horticulture in the legislature, who will help bring about the proper legislation to promote spraying, supplying fruit growers with information, also appropriation funds necessary for the work. In the favored west, spraying is often compulsory by legislative act and self protection demands it everywhere.

* * *

Only a few years ago in Missouri, and I judge the same conditions

will apply to Tennessee, the Elberta industry was seriously handicapped by that scourge, brown rot, but along came that practical and scientific workman, Professor Scott, who did so much for Georgia, Missouri, and peach growing regions everywhere. Bulletins are well and good—they are needful, but what the average fruit grower also requires is a man of science to come and demonstrate in his own orchard or those of his neighbors. Mr. Hitt, president of the Missouri State board of horticulture, says that the Koshkonong country famous for its peach industry, is a living example of demonstration work accomplished by Professor Scott. He says that they had read and reread bulletins about spraying, but little was accomplished by the committees until Professor Scott came and camped with them and as a result they are now enabled to save their crops of peaches which would otherwise be entirely lost. The growers who sprayed for brown rot last year received $1.75 per carrier for their peaches f. o. b. But all this will cost money, which must be paid by the state or national department; however, the money expended in this way is a wise and profitable investment.

Therefore to achieve the greatest success there must be an organized effort for practical application of scientific knowledge by the entire fruit growing community.

The Nurserymen's and Horticulturists' associations are doing a splendid work for Tennessee; just how generous your legislature is we do not know, but we trust the great industry with unlimited possibilities, receives the necessary appropriations because we can appreciate it will be used wisely and profitably.

The Arkansas association has done magnificent work. We have attended their meetings, which have been most profitable and their work has been one of labor and love by such workers as Captain Lincoln, Colonel Vinconheller, Professor Walker and others because they have not had state funds to aid in the work and even the state reports are published at personal expense. However, the prospects are, since the recent meeting, that Arkansas legislature will awaken to the state's opportunity. Just one illustration of what an individual did in Arkansas. Only a few years ago E. N. Plank of Benton County, Arkansas, a clerk in the government mail service, was forced to go into the mountains of Arkansas for his health. His only capital was ambition. He now has one of the best orchards in this section and last year marketed a great crop of strawberries, apples, and peaches, and some way or other, with the "know-how," his peach trees were loaded when many of his neighbors' orchards were barren; and this peach crop alone sold for forty thousand dollars. If you call such pioneers dreamers, then let us have more such dreamers. Arkansas has another noted fruit grower named Poole, familiarly called "Fool Poole, the Crank," but this crank has shown them how to grow peaches, and may every orchard region have just such cranks.

* * *

Tennessee is just as favorably situated and with the right effort may

attract immigration from the less favored states elsewhere. One of your members gave a talk last meeting on the work of the Hood River country. We have journeyed there personally to study their conditions and a most wondrous region it is. Just one man, E. H. Shepard, now editor of Better Fruit Magazine—all of you should have it along with the Fruit Grower—put Hood River on the map. At home they say Shepard is a crank, but he increased the price of their strawberries and apple product one hundred per cent. and then some. Personally he told us it was an uphill struggle all the way, but success crowned his efforts. It is said that foreigners often inquire if Oregon is in the Hood River on the map. At home the same thing is true for Grand Junction and its association. C. W. Wilmeroth, Chicago's apple man, is doing a great work for the Oregon associations. Mr. Wilmeroth is now abroad for the further development and expansion of their markets. Their success was achieved through hard work. Organized effort has accomplished the same results in the Ozark regions of Missouri.

Printer's ink is a most effectual method of educating the people and incalculable good can be done along educational lines by the home newspaper as well as the horticultural papers. Every local editor should be an enthusiast and should provide his readers with the practical information affecting their work. Bulletins and other publications of the department of agriculture contain a vast store of useful information which can be had for the asking. Such information is too often the "light under the bushel." It should be generously circulated. May the time come when every rural postoffice is a branch government library. Today as never before the high class magazines, the metropolitan newspapers, the Saturday Evening Post, which so recently told the peach story of J. H. Hale, the peach king of Georgia and Connecticut, are all publishing popular articles on various horticultural subjects. All this publicity is creating a greater desire among men and women for planting orchards and making America beautiful and fruitful.

The agricultural departments of our universities are doing a noble and far-reaching work. The tide has turned, and instead of sending the brain and sinew to the city they are now educating them in scientific agriculture. The youth of the land are learning that there is more profit, pleasure, and liberty in remaining on the old homestead and developing it.

Immigration has been westward, but they are now arriving at the jumping off place. There is a return movement and already pioneers of the west are journeying back to take advantage not only of the cheap lands in Missouri, Tennessee, Pennsylvania and New York, but even the New England States. We have observed from year to year the intrinsic value and advance of your land, the improvements and betterments of your methods, but perchance you may also note that something is lacking, that something is needful. This is capital, more capital. It takes money to develop horticulture just as it does to open your mines, or build your railroads for the marketing of your products, but the money thus used

will be the best investment Tennessee can make. The interest manifested by the members of the association and by the officers in charge is proof enough that you realize the value of your opportunity, and you should interest and strive to educate your neighbor so that the entire community may derive benefit from the work done.

WHY WE SHOULD MILK THOROUGHLY.

By P. W. WORDEN

There are two general reasons why every dairyman should insist upon his cows being milked to the last drop each and every time.

In the first place, as many of us have often heard before, a little milk left in the udder each time will decrease the amount of the flow. The inner structure of the udder is spongelike, being full of little wells called follicles. These little wells are the organs that secrete the milk and, if we do not carefully clean them out at each milking, the secreting glands will become clogged and cannot carry on their work efficiently. Furthermore, the precipitation of milk solids in these various ducts and cells creates an irritation that may impair the cow's usefulness indefinitely. First then we must use more care in stripping in order to maintain the amount of the flow, and keep the cow's udder in a healthy condition.

The second general reason, and one seldom considered, is that of the value of the butter-fat and milk lost in careless milking. At the first glance such an amount seems too trivial to concern ourselves about. Nevertheless the last few drops of milk are always very rich in butter fat and just a little lost in each cow of a good sized dairy herd, will soon amount to a very considerable sum. In support of this statement I will mention an experiment lately conducted at the University of Tennessee Station.

The cow used in this trial was just an average, grade, Jersey; one whose milk will average about 4.2 per cent. butter-fat. Her milk for one evening was drawn into 5 cans:—A, B, C, D, and E. Can A contained the first ¼ drawn; can B contained the second ¼ drawn; can C contained the third ¼ drawn; can D contained the balance to the strippings; and can E contained the strippings. Each sample was examined with a Babcock tester with the following results.

Sample A contained 2.3 per cent. butter-fat.

Sample B contained 4.0 per cent. butter-fat.

Sample C contained 4.6 per cent. butter-fat.

Sample D contained 5.8 per cent. butter-fat.

Sample E contained 11.6 per cent. butter-fat.

This shows that the strippings contain five times as much fat as the first milk drawn and nearly three times the cow's general average.

It is an easy matter for a milker to leave, unwittingly, two or three ounces of milk in the udder at each milking. For illustration, let us suppose that incompetent hands are leaving two ounces of milk in each of twenty cows. If the cows are milked twice a day, each cow will lose four ounces a day or 91.25 pounds. We have seen that these last few ounces contain 11.6 per cent butter-fat therefore each cow has a loss of 10.58 lbs. butter-fat a year which is worth $4.44 when butter sells at thirty cents a pound. For the herd of 20 cows there would be a loss of $88.80—enough to buy a good dairy cow.

LOSSES OF SOIL FERTILITY.

By H. P. OGDEN, '13.

On all sides we see poor farms. Some never were rich, others have been fertile but have become less and less productive from one of two causes: the removal of plant food, or the rendering of such food unavailable to plants. The two causes often go together but the second cause will not be considered in this article. The removal of plant food may occur in four ways: Through sale of farm products, soil erosion, leaching of soluble salts, and the escape of gaseous food elements.

Large amounts of plant foods are sold annually and carried from the farms, in the form of corn, wheat, hay, etc., to be consumed in the cities. The plant food in each bushel of corn is worth twenty to twenty-five cents; in a bushel of wheat nearly thirty cents; a ton of mixed grass hay contains seven dollars worth of soil fertility. Still on all sides there are men who entirely ignore its importance.

Of course a vast amount of hay and grain that is sold directly from the farms should be fed, and sold as meats and dairy products, thus returning to the soil in manure a part of the fertility removed by crops, yet this loss cannot be stopped. People must have food and these materials must come from the soil. Will any kind of farming stop the loss of plant food by the sale of farm products? Nothing can stop the loss of nitrogen, phosphorus, and potash occasioned by the sale of farm products; but there are practical methods of maintaining the fertility of the land, even where little or no livestock is kept.

The loss of plant food by erosion, the washing away of soil, is serious and merits our most careful consideration. Secretary Wilson, in his annual report for 1907, places the amount of soil poured into the sea

from the United States as 1,000,000,000 tons annually, which, at 1800 tons per acre-foot (I. P. Roberts), would be enough to cover 555,555 acres one foot deep with the richest soil. Burkett states that the Mississippi River deposits annually in the Gulf of Mexico, sediment sufficient to cover 100 square miles three feet deep. This means a loss of $290,000,000 in soil fertility and represents only a part of the damage annually through erosion.

Leaching of soluble plant food from our farms is another serious loss. Leaching is distinguished from soil erosion in that it applies simply to soluble salts, while erosion means the carrying away of all soil. All too common is the sight of a manure pile from which the soluble portions are continually washed away, leaving the attenuated corpse from which the spirit has long since departed. "Beal shows that one-half of the nitrogen, almost all of the phosphoric acid, and a fourth of the potash are contained in the liquid portions of the manure. Hence when manure is exposed to the weather, the most valuable portions are readily carried away. Farmers must study the various methods of preventing these losses, in order to stop the leaching of manure which every year carries away many times as much fertility as it annually purchased in commercial fertilizers.

Plant foods also leach from the soil. Under favorable conditions millions of bacteria in the soil are steadily converting complex insoluble compounds into soluble salts. If this process occurs rapidly and there are no crops growing to take up these soluble substances as formed, large amounts of plant food may be carried below the reach of plants which may be grown later on this land. The practice of leaving soil bare during late summer after removing millet, or other crops which leave little or no stubble, is especially wasteful. Bacteria are most active during July and August, forming soluble plant foods which are leached out by the winter rains. Tons of nitrogen are leached from the bare corn fields, and nitrogen is worth as much per pound as a good juicy porterhouse steak. While the loss of nitrogen by leaching is serious, other plant foods are wasted in this way.

The escape of plant food from the soil as gases is not so apparent, but it is none the less real. Nitrogen, especially, must be considered for it represents not only the greatest loss by weight but it also has the greatest value per pound. It escapes into the atmosphere as ammonia or as free nitrogen gas. In order to prevent this, a little knowledge of the processes of decay is necessary.

The decay of organic materials containing nitrogen embraces the two great processes of nitrification and denitrification. Nitrification is an oxidation process—slow burning—by which unavailable nitrogen compounds are converted to nitric acid which combines with metals or alkalies to form nitrates—salts soluble in water and available to plants. Denitrification is a process by which oxygen is taken away from nitrates leaving ammonia or free nitrogen. Both processes are due to bacteria.

Nitrification is of great use to agriculture since it causes the remains of dead plants and animals to be broken up into substances which feed plants. Denitrification is of no use to agriculture since it causes substances available to plants to be converted into substances of no use to them.

The soil may be deprived of nitrogen by either process. It may escape during oxidation in two ways: first, by the formation of ammonia during normal nitrification; and secondly, by the formation of ammonia during too rapid oxidation of the carbon and hydrogen combined with it. The formation of ammonia cannot be stopped since it is a necessary step in the process of nitrification; the evaporation of this ammonia may be materially checked in various ways. According to Wagner, 35 of the 39 parts of nitrogen contained in fresh liquid cow manure are converted to ammonium carbonate in four days and under more favorable conditions when the solid portions are added, the action is more rapid. Ammonium carbonate is quite volatile hence care must be taken to prevent fresh manure from drying until the bacteria have changed it into a nonvolatile substance. If fresh manure is scattered on land during warm dry weather much ammonia may evaporate, because there is water enough at first to cause formation of ammonia during warm weather when the bacteria are most active, but as the manure dries the bacteria cease their work and the ammonia already formed escapes.

Too rapid oxidation occurs when large amounts of organic matter are in suitable condition for bacterial growth and are supplied abundantly, with oxygen. Such conditions arise in loosely piled manure or in light sandy soil in which large amounts of undecayed manure or green crops have been turned under. The ensuing bacterial action literally burns up the humus; carbon and hydrogen are rapidly oxidized, leaving the nitrogen combined merely with hydrogen as ammonia or else not combined with anything in which case it escapes to join the 3,994,593 billion tons already in the atmosphere. These then are the two ways nitrogen escapes during oxidation; evaporation of ammonia, and burning of organic matter liberating either ammonia or free nitrogen gas. Losses suffered through denitrification are due to limited supply of oxygen, since this process robs nitrates of oxygen in the decay of vegetable and animal matter. Several steps are encountered in this process and many different kinds of bacteria are required. We need not enter all the steps since conditions favoring a part of the process, affect all in much the same way.

Conditions favoring denitrification are: The presence of nitrates; undecayed organic matter containing carbon, hydrogen, etc., a limited supply of free oxygen; and denitrifying bacteria. When the conditions of temperature, moisture, etc. are favorable, decay of the organic material begins, the free oxygen is all consumed and more oxygen must be had or else the fermentation ceases. This needed oxygen is supplied

by the work of the denitrifying bacteria. They seize the nitrates and rob them of oxygen, leaving the nitrogen free which then forms a part of the air we breathe. Conditions favoring this action are encountered where there are large amounts of nitrates and decomposing material poorly aërated. In all cases the action is more rapid during warm weather than during cold.

The monetary loss involved in the improper control of bacterial activities in manure is indicated by the following figures: Assuming the amount of manure and litter for one cow at 15 tons annually, the total amount of nitrogen contained in the manure of one cow would be 130 pounds (Lipman). With 60,000,000 head of cattle in the United States and a value of 18 cents per pound for nitrogen, the total value of the nitrogen produced would be $1,406,000,000. Lipman assumes the loss due to the improper control of bacterial activities in the manure to be 20 per cent. of its value; that is, there would be a loss of $281,200,000 due to improper handling of cow manure alone.

These are the four leaks through which the mineral plant food elements escape from the soil. Of course there are other factors causing farms to become less productive than the removal of plant food. But only the latter cause has been considered. The loss of plant food from the sale of farm products is enormous but inevitable. The losses due to erosion, leaching, and escape as gases are much more enormous but may be largely prevented. The task of preventing the useless loss of fertility and the problem of replacing plant food that is lost from the farm are of greatest importance of soil fertility. In a future article methods of replacing soil fertility lost in the sale of produce will be considered.

THE CODLING MOTH (Carpocapsa Pomonella)

By W. K. TIPTON, '12

The codling moth, or apple worm as it is commonly called, is very well known in most sections where apples are grown. It was imported into America about 1740 and since that time has spread to every part of the country. At present it causes the fruit growers a loss of more than $10,000,000 annually.

The adult is a small brown moth about ¾ inch across the wings which are square cut at the ends and are marked with cross lines of gray and brown, with brownish black at the edges. This moth is best known to the majority while in the caterpillar stage. The small pinkish worm about ½ inch in length is found around the core of the apple. The damage done to the apple crop by the codling moth is more than that caused by any other two apple pests.

A knowledge of the life history of the codling moth is almost necessary for one to be able to combat it effectively. The adult appears

in the spring about the time that the apple trees are in bloom. Late in the evening the females can be seen flitting about the trees depositing their eggs singly on the leaves, or preferably on the young fruit which is just beginning to form. The egg hatches in a few days and the worm enters the little apple through the calyx, and occasionally from the side. The damage done is well known to every one. Many of the apples ripen prematurely and drop off. Those remaining often show slight signs of infection, except a mass of dijecta on the blow end. When this insect is about to complete its life as a worm, in June or early July, it eats a channel usually through the side of the apple and crawls down the trunk of the tree and hides under the bark of the tree or under rubbish on the ground, where it forms a small dirty white silken cocoon and remains for six to twelve days before becoming a chrysalid. The chrysalid stage lasts four to fourteen days. The adult emerges from the chrysalid, mates and begins to deposit eggs in about four to twenty days. The second brood hatches and goes through similar stages as the first brood, up to the chrysalid stage, in which stage it passes the winter, the adult emerging in the following spring. In some sections of the South, there are supposed to be three broods in a season.

There are several ways of combating this destructive pest. The most effective is to spray with a poison, such as arsenic of lead four to five pounds to 50 gallons of water, or Paris green four to five ounces to 50 gallons of water. These sprays are applied just after the petals are fallen, before the calices close and the fruit turns down on the spurs. For the best results the spray must reach the inner side of the calices, so that the developing worm will get this poison, when they eat their first meals from the green fruit before entering. A second application of this spray should follow in about ten days. A third and fourth application, at intervals of about ten days, are recommended by many fruit growers, but usually two sprayings timely and thoroughly made are considered sufficient.

For the second brood the trunks of the trees may be girdled with "fly sticky" or "tanglefoot," or bands of carpet and old sacks. The former catch the worms as they crawl down the trunks. The latter serves as a hiding place for them to go into winter quarters. These bands should be taken off about every ten days and the chrysalids destroyed. A few hogs running in the orchard will destroy a great many worms, by eating the fallen apples before the worms emerge from them.

The codling moth in several states has an effective enemy in the form of a very small bee (Trich ogramma pretiosa), which searches out the eggs of the codling moth using them as hosts in which to deposit their eggs. These eggs hatch in forty-eight hours, and the worms devour the contents of the codling moth's egg.

Since nature has only partially supplied us with enemies of the codling moth, hence in order to avoid heavy losses to the apple crop, we are compelled to assist her in combating this harmful fruit pest.

TENNESSEE SHOULD RAISE MORE SHEEP.

By PAUL P. HITE, '13

With the first warm days of spring in the Northern and Eastern states, there arises a strong cry for the lamb chop and the leg of mutton. Tennessee is the state that ought to strive hard to supply this great demand. Because of the mild winter and the early spring, it is possible for Tennessee to finish lambs two or three weeks before Kentucky, her strongest competitor. This state is a strong rival because she produces lambs of better quality and higher finish, due to the breeding. Most of the Kentucky lambs are from pure bred ewes or from high grade ewes of the Down breeds.

In 1908, there were shipped to the Northern and Eastern markets from Tennessee only 127,921 sheep and lambs.

From reports of farmers, living in different parts of the sheep raising sections, there is little doubt that the early lamb business is the most profitable of all lines of stock husbandry in Tennessee. The lamb can be produced more cheaply than any other kind of live stock. The grower can safely expect 100 lambs from 100 ewes and frequently gets as many as 125 lambs. The only feed given in many sections is hay, permanent pasture and the winter cereal pasture. An investigation made in 1907 and 1908, showed that but few farmers fed grain to either the ewes or the lambs: But the men who fed grain found that it paid well both for themselves and the shipper.

Professor Quereau says, "There is no doubt that a small grain ration fed to ewes in the early spring before the grass gets strong would cause a heavier flow of milk, and consequently a more growthy lamb. If the lamb was fed grain every morning before going to pasture, it would make better gains and prevent heavy shrinkage in transportation. Grass fed animals of any kind, are considered as poor travelers." Any man can see from the above facts that he must feed grain to his lambs if he wants to compete with other states.

In Tennessee, most any kind of a cereal crop such as wheat, oats, barley or rye can be grown to start the lambs to growing, before the grass is long enough for pasture. These pastures makes the mother have a good flow of milk, which starts the lamb to growing early.

Some men say that there is too much risk in raising sheep on account of the loss from dogs. Most counties of the sheep raising sections have a dog law which forces a heavy tax on all females, and makes the owner liable for all the damages done by the dogs. Many sheep raisers keep fox hounds, which have been found very valuable in warding off the common cur.

Tennessee has great areas of hill land admirably adapted to sheep raising, and of very little value for anything else. Sheep have been known to increase the fertility of such land 100 per cent. Middle Tennessee has been greatly improved by sheep husbandry and will continue

to grow sheep, but it is the more hilly parts that ought to produce the larger numbers in the future.

If the growers would get a better grade of ewes and cross on them pure bred rams of the Down breeds, they would get a much better lamb than they now get from the Alabama and Georgia scrub ewes.

The time is fast coming when these Southern scrub ewes can no longer be had. The sheep raiser should depend on his own breeding for his future flock, take better care of them, feed a grain ration, and he should be able to compete with any other state in growing early lambs for market.

POTATO GROWING.

By JUDD BROOKS, '12.

As each year passes, the potato becomes of greater importance as a commercial crop in the United States. It serves as one of the principle sources of food in the Southern States, also a source of starch. The production of the potato growing portion of the world from 1904 to 1908 was on an average of three and one-fourth billions of bushels. The production of the United States for the same length of time was an average of 295,000,000 bushels, or about seven per cent. of the world's output. When the potato crop is compared with the other crops produced in this country, it seems very small. The United States produces about 79 per cent. of the corn crop, 22 per cent. of the wheat, 65 per cent. of the cotton and 40 per cent. of the world's oat crop.

The average yield of potatoes in the United States is very small as compared with that of the other potato growing countries. The average yield per acre for this country from 1899 to 1908 was 89.8 bushels. The average yield of Russia was 98.4 bushels per acre. The yield of Germany runs to 197.3 bushels per acre, that of Austria was 151.4 bushels, that of Hungary 117.8, of France 118.1 and the yield of the United Kingdom runs up to 186.4 bushels per acre. From the above data it can be clearly seen that the United States is at the very bottom in potato production. The output for Tennessee for the year of 1909 ran up to 2,125,000 bushels, the average yield for the State was 75 bushels per acre.

Many farmers have no desire to increase their potato crops. Still their are others who wish to increase their yield per acre. Many send to the Northern seed firms and purchase seed that are not adapted to the Southern climatic conditions, and a poor yield is the consequence. It takes more than a new variety of seed, said to have produced 250 bushels per acre, to increase our yields greatly—more perfect methods of culture will do much more toward increasing the yields than the purchase of a new variety of seed. It improves the crop to have good seed, but organic matter or humus forming material is needed in the soils in order to develop the seed when planted.

The potato plant drains heavily upon the water content of the soil. It takes 423 pounds of water to produce one pound of dry potato matter, where on the other hand it takes only 273 pounds of water to produce one pound dry matter in corn. In addition to the large amount of water, much nitrogen, phosphoric acid and potash are used. A crop of 75 bushels, the average yield for the State for 1909, would remove fifteen pounds of nitrogen, three pounds of phosphoric acid and twenty four pounds of potash from the soil. These elements purchased in the form of a fertilizer would cost $4.50. Professor King of the University of Wisconsin found that much moisture could be retained by plowing early. He ran the following experiment in order to determine the retention of moisture at different dates of plowing: Two adjacent plots of soil very uniform in character were taken, and plowed seven days apart. At the time the second plot was plowed, it was found to have lost 1.75 inches of water from the surface four feet in seven days. The first plowed plot was found to have actually gained moisture—due to the increase of capillary attraction. It was found that there was a gain of nearly two inches of moisture in the root zone by plowing one week earlier, or enough water to produce 942 pounds of dry matter in potatoes, if properly conserved. The month of March has the greatest rainfall in Tennessee, which is on an average of 5½ inches. The soil should be well plowed and worked up long before this time, in order to catch and conserve the greater portion of the early rain-fall. The average rain-fall for the whole of Tennessee is 47.36 inches, as recorded in Tennessee Station Bulletin 87, and the rain-fall for the potato growing season, after the potato is planted, is 4.7 inches. If we could conserve 15 inches of the 47.36 inches which falls annually, about 7,070 pounds of dry matter of potato could be produced on an acre. From the above data it seems that their is no reason why the potato crop of Tennessee could not exceed 125 bushels per acre.

The selection of the seed is very important, when the potato grower goes to a farmer or seedman for a certain variety of seed, does he get just what he has ordered? If the farmer or seedman is careful, and has not allowed the many different varieties to mix, the seed procured may be very near what is ordered. The potato plant is the same as any other plant, and will not remain true to type long if grown close to other varieties. In order to obtain the best seed, one should select them from hills containing but few large potatoes. By doing this for several years, a better strain with the ability to produce larger yields can be developed. A given number of hills may be planted in a row and certain hills of the best potatoes taken from each row as in the ear-to-row corn test.

The method of selection of the general farmer is to dig or plow up all of the crop at once and pile them together. During the winter such potatoes as are not large enough to be salable are saved out as seed. Small potatoes are not the best to use for seed—the medium sized are much better. The potato is like all other plants, and the more food that is furnished the young plant, the more vigorous it will be. For this

reason, tubers can be produced both larger and sooner from the large seed than from small.

Many times the seed tubers are diseased with the scab, and to plant them in the same soil they become more diseased, if they are seeded in soil rid of the scab, it will be inoculated there and for that reason the potato should be in a rotation. The seed should be treated with formalin. This treatment consists in immersing the seed in a solution of one pint of formalin in 30 gallons of water for two hours. This treatment should be made before cutting the potatoes for seed. Much attention should be given to the cutting of the seed. The Department of Agriculture has tested this matter and has found that larger yields are obtained from half potatoes. The next largest from whole; then quarter, two eyes to the piece and so on, where pieces with one or two eyes are used it is often advisable to use two pieces to a hill in order to get a uniform stand.

Potatoes are planted in ordinary practice in rows so as to admit cultivation in only one direction. The rows are spaced from thirty to thirty-six inches with reference to the uniformity of the soil and the implements with which they are to be cultivated. The seed are dropped, either with an automatic planter or by hand from ten to fifteen inches distance in the row. The character of the soil and climatic conditions governing the interval of planting. The uniformity of the soil controls the way of planting, whether level or in ridges. The seeds are covered from three to four inches deep depending upon the character of the soil and climatic conditions—plant shallow on soils that have a high retentive capacity for moisture and deep on light sandy soils.

As stated before the major part of the cultivation should be done before planting the crop, after the seed are planted the 60-tooth harrow and weeder may be used to an advantage, as they keep a dust mulch over the soil, conserve moisture and uproot the sprouting weeds. When the plants are up a few inches the spike-tooth harrow or the five-tooth cultivator can be used; with these harrows the crop can be cultivated level and, at the same time, keep the potatoes covered in order to prevent them from sun-scald.

In Tennessee it is often necessary to spray for the potato beetle—a solution of either Paris green or arsenate of lead, at the rate of eight ounces to 50 gallons of water may be used. The Paris green burns the leaves when used alone but not when used with Bordeaux mixture, which is made from water, lime and copper-sulphate; this mixture is applied with a nozzle that produces a fine, mist-like spray. It should be applied to both the top and undersides of the foliage. Automatic horse sprays are used on a large scale, but for small crops a knapsack or other hand spray may be used to an advantage. The spraying must be thorough to be effective.

With the heavy rainfall, and other climatic conditions which furnish the farmer an opportunity to grow two crops in one season, why can not Tennessee become the leading State in the Union in potato yield per acre?

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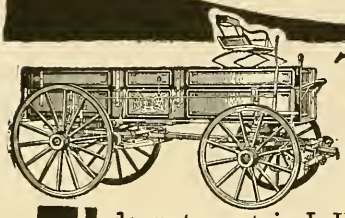

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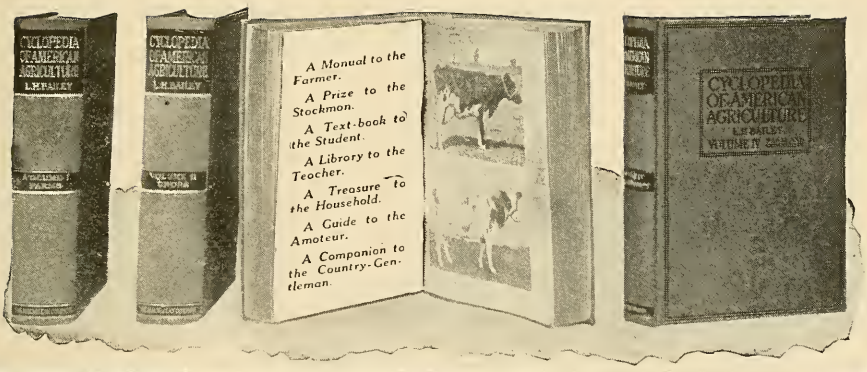

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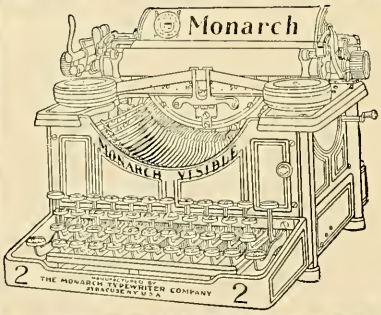

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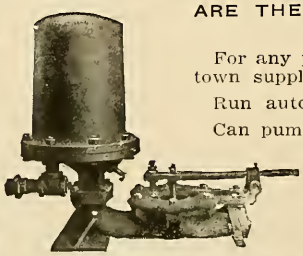

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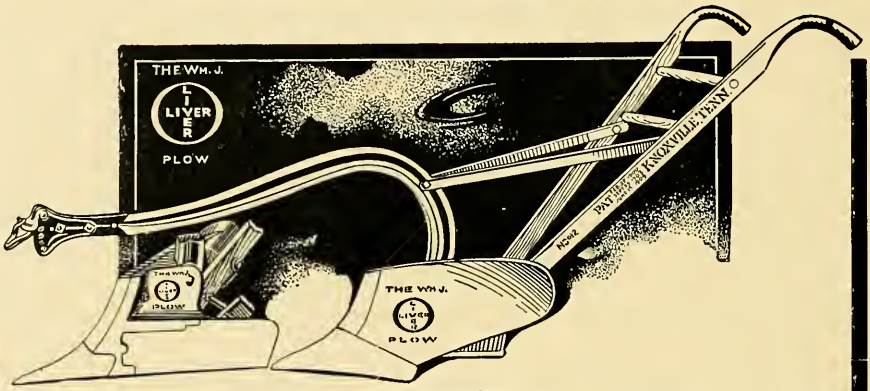

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Roosevelttisms

"Keep in mind, young man, that you have got to serve as a sergeant, before you can assume the duties of commander-in-chief."

"The poorest way to face life is to face it with a sneer."

"The worst lesson that can be taught to a youth is to rely on others and to whine over his sufferings."

"Love of country is an elemental virtue, like love of home or like honesty or courage."

"The forces that have made farm-bred boys the leaders of men are still at work in our country districts."

"The first requisite of good citizenship is, that the man shall do the homely, every-day, humdrum duties well."

"There are three qualities for the lack of which no brilliancy can atone, courage, honesty and common sense."

"When men get too comfortable and lead too luxurious lives, there is always danger, lest it eat like an acid into their manliness of fibre."

"Softness of heart is an admirable quality, unless it extends its area and becomes softness of head."

"Free people can escape being mastered by others only by being able to master themselves."

"The boy can best become a good man by being a good boy--not a goody-goody boy, but just a plain good boy."

"The old pioneer days are gone, but the need for the pioneer virtues remains."

THE U. T. FARMER

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WHAT OF THE FUTURE SUPPLY OF PHOSPHORUS?

This is the Element in Which Our Soils Are Most Deficient, and Which We Have Least Facility for Supplying—Supply Phosphorus and Conserve Rainfall.

By PROF. H. A. MORGAN, University of Tennessee.
(From Progressive Farmer.)

As we look about for permanency in agriculture we must first consider soil fertility. Of the plant foods, nitrogen is abundant in the air, and the supply is perpetual. It was here for our forefathers and will be here for our posterity. We have learned through legumes and soil bacteria how to get the nitrogen out of the air. We need not worry about this element. Potash is generally supplied to soils in fair amounts. A good system of farming naturally conserves potash, and we have less concern for the fertility of the soil of the future with reference to potash. But what about phosphorus? Ought not we of the South to wake up to the importance of this element as the one limiting soil fertility and crop production in the future? The importance of this element is not understood by our farmers. It is more important that we should realize the situation with reference to this element than all of the others. Millions of acres of the soils of the South are actually low in phosphorus for present needs. It is not in the air, like nitrogen, and is not naturally conserved under average farming like potash. It is, however, being mined in portions of the South and being shipped elsewhere. Our highest grade phosphate rock is being shipped to Europe to establish permanency in soils there. It seems a short-sighted policy for us to send out of the South that element which in a few years we will have to purchase elsewhere from a limited market to make the production of our crops at all profitable. In other words, we are selling today that which we will most need tomorrow.

There are many problems in connection with the permanency of the South's agriculture, but all are insignificant as compared with this one—our future phosphorus supply. Were it possible, we should own enough phosphate deposits to supply our farms as the future demanded. But this opportunity is practically beyond us now. There is no greater obligation

demanded of our educational institutions than that of urging our people to supply the element of phosphorus at once to all lands of the South, in those amounts that will guarantee the future owners at least a moderately productive soil. I fear we are living too much for the present. This attitude, in so far as it applies to nitrogen, and potash, and lime, will do no serious harm. With these, posterity will be by nature well provided. But in the case of phosphorus it is different. The South is now under obligation to supply its deficient soils from its own phosphate beds. This lesson should be taught from every school until we recognize its importance. I trust that every reader will feel the weight of this obligation. If you are fortunate enough to possess a farm well supplied with phosphorus, remember you are a citizen of the South, and that the future prosperity of the South demands that all its farms shall have a liberal supply of phosphorus.

Carbonate of lime, which is being given much emphasis of late, is fundamental in soil development. There is no danger, however, of a shortage of lime. A thousand years from now there will be ample for the needs of the millions who populate the South. How different with phosphorus! The present generation may witness the South's supply of phosphate practically exausted. The message of lime is, "Now"; that of phosphorus, "The Future."

It is possible that with an intelligent use of lime now, future generations may be better able to scrap for the phosphorus, but in the light of present investigation, no such risk should be run.

There is another matter deserving attention: The companionship of deep tillage and vegetable matter in the conservation of one of the South's greatest assets, her rainfall. Instead of permitting our rains to deplete and erode our soils, let us turn them into channels of production. Our greatest grain or forage acreage is in corn. This crop requires large supplies of water for maximum production. The South when equipped to conserve her rainfall will be the Corn Belt of America. The greatest factors in the conservation of moisture are vegetable matter and deep tillage. These are easily accomplished under judicious systems of rotation, which provide ample cover for the land during the winter, and an abundance of vegetable matter for turning under in the spring, or feed for live stock to produce stable manure under systems of animal husbandry farming.

To accomplish most economically a deeper soil, well provided with vegetable matter, less acreage per farm must be undertaken. The paramount weakness in the agricultural system of the South, other than our inability to recognize the limited supply of phosphorus, is too much land badly handled. Too many acres under the plow is largely responsible for the rental system. Think of more than 50 per cent. of the lands of the South operated by persons who do not own them! Animal husbandry and conservation of rainfall, by the addition of tons of vegetable matter per acre and by deep tillage are impossible under such a system. There is

nothing else that will head the South so quickly toward live stock farming, or do so much to make live stock farming permanent, as the operation of small farms by their owners. Conservation of our farm resources and the ideal rural life so much talked of now will more than likely be realized when the owner of the small farm is the actual operator.

FERTILITY LOST BY BURNING STRAW AND STALKS.

By JUDD BROOKS, '12.

In each portion of the State, there are to be found farms on which the straw and stalks are being burned each year, instead of plowing them under. The crop refuse is burned many times in order to decrease the ravages of the Hessian fiy, smut and the boll weevil. There are only few soils in Tennessee that can stand the practice many years in succession. This nitrogen, as many farmers think, cannot be replaced by growing some leguminous crop which will be removed for hay. It is true that the beans, peas and clovers drain very little upon the nitrogen content of the soil. Their nitrogen comes principally from the air through the agency of bacteria known as nitrogen-gatherers. However, the phosphorus and potash comes directly from the soil, and in order to maintain the fertility of the soil, these elements must be replaced either by the use of straw, stable or green manure, or by the application of some form of commercial fertilizer.

The wheat, oat, barley or whatever the cereal crop may be, is threshed. Some of the straw is used by the farmer as feed or as bedding—but many produce more than they can use to an advantage in this way. Many times they cannot sell it, by not having access to a railroad, or there isn't a market for the product. This being the case, the straw ricks are burned. By doing this, much nitrogen, phosphoric acid and potash are lost. In a 25 bushel crop of wheat, yielding one and a quarter tons of straw per acre, 125 pounds of nitrogen worth 15.5 cents a pound, two pounds of phosphoric acid worth 12.5 cents per pound and 17.5 pounds of potash worth 6 cents a pound are lost. This straw when burned would require 1.5 tons of barnyard manure to replace the nitrogen content. For a fifty-acre field, it would require 75 tons of manure to replace the nitrogen burned in that amount of straw; also, at $2.60 a ton it requires $120.00 worth of manure to a fifty-acre field in order to replace the nitrogen removed by the straw.

The soils of Tennessee are in need of humus-forming material. Even the richest of river bottoms have been known to increase their yields greatly where organic or humus materials were added to them. For this reason the farmers cannot afford to destroy the farm refuse in any such way. Can the wheat, oat, or barley straw be utilized in any other way? The Maryland Experiment Station Bulletin No. 122, gives an account of

wheat straw being used upon plats in comparison with barnyard manure. Two tons of wheat straw per acre were applied in the summer or early fall, and plowed under in the spring. The following are the results of corn and wheat produced upon the treated acres: The check or untreated plat produced 34 bushels of corn and 16.3 bushels of wheat. The strawed plat produced 58.3 bushels of corn and 19 bushels of wheat. The manured plat produced 86.1 bushels of corn and 22.1 bushels of wheat per acre. From these results, it can be seen that the straw is not as available to the plant as the manure, even if it does contain the same amount of food elements per ton. The use of the straw has increased the corn yield 24 bushels and the wheat 2.7 bushels per acre. The straw used as bedding and applied in the manure, increases the corn yield to 28.1 bushels, and the wheat to 3.1 bushels over the use of the straw alone. Such an experiment is being carried on in Middle Tennessee by the co-operative branch of the Experiment Station. It may be seen from the above data that a farmer cannot well afford to burn his wheat straw.

A 50 bushel corn crop takes 74 pounds of nitrogen, 11.5 pounds of phosphoric acid, 35.5 pounds of potassium and about 16 pounds of calcium and magnesium from the soil. This amount of calcium and magnesium would be equal to 30 pounds of either calcium or magnesium carbonate. The farmer burns the crop of corn stalks, and by doing so, loses 24 pounds of nitrogen completely. This loss will require at least 25 tons of barnyard manure, or 1,500 pound of clover turned under as green manure to replace it. To replace this nitrogen in the form of ammonium sulphate, dried blood or sodium nitrate, it would cost $3.72. The common practice of the farmer who burns stalks is to rake them into wind rows as hay is usually done. These rows are then burned. The 24 pounds of nitrogen goes off in the atmosphere. The 11.5 pounds of phosphoric acid, 35.5 pounds of potassium and 30 pounds of lime carbonate are left in the plant ash in streaks across the field. This condition shows what bad farming is doing. It decreases the nitrogen content of the whole field and all but certain places are being decreased of the other essential elements of plant food.

A crop of one bale of cotton per acre removes 84 pounds of nitrogen, 14.7 pounds of phosphoric acid, and 41 pounds of potassium from the soil. The stalks of the crop raked and burned remove 51 pounds of nitrogen from the soil. It would require five and a quarter tons of manure or one and a quarter tons of clover as green manure to replace this loss of fertility. Many farmers are burning the cotton stalks in order to eradicate the boll weevil, and by doing so lose enough nitrogen per acre to amount to $7.91 on the market in the form of nitrate of soda. Through observation botanists have found that when the boll weevil destroys the reproductive organs,—preventing the plant from seeding; the stalk is developed to a greater extent than when not injured. This gives the stalks a larger nitrogen content, and when burned, more of this element is freed into the atmosphere.

Not only should the farmer consider the nitrogen loss from his soil, but also the humus-forming material. Through the decomposition of the organic material, the fertilizers and plant food already in the soil are made more available. the soil is more porous, the water holding capacity is increased, and the air content of the soil is often doubled.

From records of experiment stations and from observation, it is found that prosperous farmers do not burn anything from the farm, but use it as food, bedding and for fertilizing purposes.

There are hundreds of farms in Tennessee, that are calling for nitrogen, phosphoric acid and lime, still many farmers continue to rob them of the little plant food they contain by burning the straw and stalks. Can the farmer continue this practice and be successful?

AGRICULTURE IN THE PUBLIC SCHOOLS.

By A. F. ROLLER.

In all ages, in every race, with few exceptions, agriculture has been the chief occupation of mankind. Nearly every industry is dependent upon agriculture for its raw material. The grocer, the butcher, the baker, the miller, the worker in textile industries—all must look to the farmer for their source of material.

The figures representing the value of the yearly products of the farm are staggering. The total wealth produced by the farmer last year amounted to more than $8,760,000,000. This is more than the annual production of all the gold and silver in the world. More than four-fifths of all the corn in the world is produced in the United States. The corn crop last year was worth more than one billion dollars. As a wealth producer the farmer is king of men. He is the Atlas upon whom the business world rests. Unless he is successful the wheels of commerce will not go round. It is estimated that if agricultural operations were to suddenly cease, within twelve months the human race would become extinct.

Now if this occupation is so important does it not follow that the race should prepare to do as efficient work as possible in this profession? Of all lines of work this one probably has the highest per centage of unqualified workers in its ranks. It cannot be denied that the farmers ought to be trained for their duties just as engineers or any other people ought to be prepared for their work. We are told by Secretary Wilson of the Department of Agriculture that if every farmer of the country could and would select his seed corn intelligently there would be a total annual increase of thirteen per cent. in the production, representing an annual increase in the farmer's income of seventy-five million dollars. The study of scientific agriculture not only will teach him the right seed corn selection but will also show him how to make his soil absorb part of the ten million dollar's worth of nitrogen that is above every acre in the

United States. As yet he has been slow to take advantage of the knowledge which the chemist has worked out for him.

The average farmer today farms as his father and as his grandfather did. Emerson says "that every man is a quotation of his ancestors" and never has a truer thing than this been said of some farmers. In many localities they are waking up but the great mass of them are as Markham said,

"Bowed by the weight of centuries, he stands and gazes upon the ground,"

And well may it be asked,

"Whose hand slanted back that brow?

"Whose breath blew out the light within that brain?"

To solve this problem is the work of the public school, but at present it is not equal to the task. The reason is that the teachers who have charge of the schools are not fitted for teaching agriculture. Often the country teacher keeps school instead of teaching school. He simply "hears lessons." When we remember that in the country less than ten per cent. of the school children ever get into the high school we see that it is down in the grades that the real love for the farm, the real interest for nature's mysteries is created. What a wonderful thing is the study of life! Yet how few pupils in the country schools are ever instructed in the most elementary principles of biology. Their very heritage the thing which their minds are interested in most, is carefully guarded from them. They are lined up on the floor and given a long list of words to spell with the penalty for failure attached.

There are many ways to arouse interest in agriculture among the pupils. Let the teacher teach nature with nature. Let him get some leaves from the forest trees, if nothing else, and teach the shape, structure and use of them. He could place a flower where it could be seen by the whole class and then have each one draw it and name the parts. He who attempts to teach nature with only a book will inevitably fail.

We are aware that the "three R's" are of prime importance but we also believe that if a little spice, consisting in the study of the things about which every country child is naturally interested, were injected into the dry facts of the daily program, more progress would be made. He would see that after all, the schoolroom is not simply a place of punishment where each one is required to serve so many hours each day. But the high school would get more geometry pupils and the college more Latin students.

Some may say, "Why do not our college men go into the country and carry the glad tidings?" The answer is being made yearly by our college graduates who, as soon as they become able to teach, are worth more money than the country schools can or will pay. Hence some unqualified person is employed, at forty dollars per month, to teach the school and who, if he were to attempt to teach the most elementary truths of zoology could not distinguish between a grasshopper and an

aeroplane. In most localities our country school system is a farce. No attempt whatever is made to beautify the school grounds with shrubbery and rarely is any work done on inside decoration.

The State says, "Agriculture shall be taught in the public schools." But no provisions are made in the law about the methods of teaching it. In a certain school we once knew a teacher who required the pupils in agriculture to commit to memory the symbols for all the elements and to name the principle constituents of water, salt and fertilizer and this was the extent of his instruction. Laboratories had not then come into fashion in that school.

But such a system of teaching will not always remain in the country. There will come a time when the country teacher will have to wake up. Instead of "keeping school" he will be required to teach school. Such a state of affairs is rapidly developing now in some sections. Before many years the country boy will have as good equipment and just as efficient teachers as his city cousin has in his school. In spite of his rude training he still continues to furnish the brain and brawn of the Nation, and is the one whom business men will trust. The country school will someday demand better teachers. When that time shall arrive the tide of migration will be away from the city instead of toward it.

Now we know that agriculture is the greatest occupation in the land and that it is a calling that needs trained men. Still there are few who are well enough acquainted with the science of agriculture to do intelligent farming. This, as we have seen, is the fault of the teacher who himself is not capable of teaching the subject. While we cannot offer an immediate solution to the problem, we believe that it will gradually solve itself. In the meantime let us hope that the persons who are teaching in the grades will this year collect some material for a sort of laboratory as it were and do better work in their schools than ever before and hasten the much needed revolution in methods of teaching.

HOW THE FARMER IS BENEFITED BY KEEPING IN CLOSE TOUCH WITH THE STATE EXPERIMENT STATIONS.

By S. M. BARNES, (From De Laval Monthly)

Many are the things that can be learned from the Experiment Station, if the farmer will only visit the stations and ask questions so that things can be explained to him. Then, when the bulletins come out publishing the results of various investigations, the farmer can understand them to much better advantage. For instance, the method of tilling the soil is something that plenty of farmers do not care to read about, because most of them think they know about that already, while if they should go to the Experiment Station and see a deep tillage plow at work as it turns up the soil eighteen inches deep they would marvel,

and would immediately begin to ask questions as to why this is an advantage, etc.; thus they become interested in this as well as other things, and are greatly benefited by their contact with the station.

Many farmers do not know why crops should be constantly cultivated, regardless of the growth of weeds, and rainfall; others think that the rotation of crops is troublesome, and continue to repeat the methods of their forefathers until they have sapped the very life out of their land. Then some day the farmer gets an invitation to attend a farmers' meeting at the Experiment Station, and out of curiosity he attends, thinking only of seeing the crowd and possibly of airing his ideas on politics or some kindred subject of minor importance.

While at the Experiment Station he drifts out into the Experiment Farm, where he begins to see things. He hears the explanation about the rotation of crops, sees the deep tillage plow at work, he sees the results of intensive farming, he learns how he has been wasting his land by selling it off a little at a time in the form of crops, he learns that he has been very unwise in his choice of fertilizers and that he lost several hundred dollars last year by not testing his seed corn, wheat and other grain. In other words, his eyes were opened, and he goes home full of enthusiasm and begins to think. He then returns to the station and asks some more questions, with the result that he will probably, in time, make a more successful farmer of himself. This is about the testimony I got from a dairy farmer whom I had induced to attend a big farmers' meeting at the Tennessee Experiment Station. He owns just 100 acres of land, but is making every foot of it pay.

In considering the good that the Experiment Stations may do for the farmer, we have only to look up some of the past records of their work. For instance, take the State of Tennessee. For many years clover was a complete failure in many portions of the State, and the farmers lost thousands of dollars by not being able to grow this valuable crop. But along comes "Mr. Experiment Station Man" and begins to investigate. After long and tedious work he discovers the cause of this clover disease, for it was nothing else but a disease, and after a while the farmers over the country began to read about "Bain's Immune Clover." After a while he began to tell the farmers about it and how he had gone into the fields and selected the strong, hardy clover plants that had resisted the disease where all other clover plants had died, and by nursing and propagating them had succeeded in getting seed of a new variety of clover which is immune to this disease. The result is that many farmers are now raising this clover, and gradually Tennessee is regaining its clover prosperity of old. All because the "Experiment Station Man" took the time and had the patience to study this matter out. It was not the work of days only, but it required years to do it. This one piece of work is worth thousands of dollars to the farmers of Tennessee alone.

Another thing that has been taken up and studied by the Experiment

Stations in Tennessee is the testing of the varieties of crops best adapted to different localities, and selecting the varieties that are best suited for farmers in each section. For example, much work has been done with the sojo-bean. Many varieties have been tested and it has been determined that this is one of the most valuable forage crops the South has. It builds up the land by gathering nitrogen from the air, and at the same time furnishes a food for all classes of farm animals.

Many other crops, such as beardless barley, vetch, crimson clover, alfalfa and many other forage crops, have been exploited and developed for the benefit of the farmer.

Investigations are going on all the time along the lines of feeding farm animals. This one statement, the feeding of farm animals, should stand out like an electric sign before the farmer all the time, for therein lies his future salvation. Too many farmers are mining their soil, just like the coal miner digs the coal from the earth and ships it away. The mining farmer grows crops on his land, these crops remove the fertility from the soil, and he continues to grow and sell these crops year after year until the land becomes worn out. He has sold all the fertility from this land and now he is going to try to make it produce by giving it a "hyperdermic," so to speak, of commercial fertilizer, which only stimulates it to use more of its strength to produce another crop, leaving it poorer than before. But about this time along comes Mr. Experiment Station Man again, and he cries out in a loud voice, "Stop, you robber! Can't you see that you are robbing your own bank? Every crop you send away from your farm impoverishes the land and makes you poorer, unless you systematically and economically replace the plant food that is removed by each crop." The Experiment Stations usually teach the farmer to feed the farm crops to live stock and market the finished product in the form of milk and butter, eggs and poultry, pork or beef. These animals consume the crops and return to the land in the form of manure about three-fourths of the plant food contained in them, while at the same time paying the farmer a good price for the crop.

If the farmer insists upon using commercial fertilizer, instead of live stock, in building up his land, the Experiment Station can also help him in this matter. The general habit of the farmer is to buy ready-mixed fertilizers, for which he pays a large price without knowing very much about their contents. In the first place, he pays too much for the mixing and seldom gets enough plant food on the land. The Experiment Station people always advise the purchase of unmixed goods and encourage the farmers to first find out what their land needs most, then add the fertilizer accordingly, and in the most economical form. For instance, suppose the farmer buys the fertilizer known as 8-2-2 goods. What does this mean? Very few farmers know, but it means that in every hundred weight of this fertilizer there are 8 lbs. of phosphorus, 2 lbs. of nitrogen and 2 lbs. of potash. The phosphorus is worth 5 cents per pound, the nitrogen is worth 20 cents per pound and the potash is worth

6 cents per pound, which makes a ton of this mixture worth $18.40, while the farmer generally pays from $22 to $24 per ton for it. Mr. Experiment Station Man says, "Farmers, why don't you get your nitrogen—which is the most expensive part of the fertilizer—from the air? There are millions of dollars' worth of it over every acre of your land, and you can have it for your own if you can get it." And he goes on to tell the farmer how he can save thousands of dollars by planting legume crops and allowing them to gather the nitrogen from the air and store it in the soil. Then he should feed these crops to live stock, the dairy cow or the beef steer, and return all of the manure to the land. Every ton of this manure carries back to the soil a certain portion of each of the plant foods, and the value of this manure ranges from three to five dollars per ton. The legumes gather nitrogen from the air and this manure returns nitrogen, potash and some phosphorus, as well as a vast amount of humus, which leaves only a small amount of phosphorus for the farmer to buy.

The last thing that I will bring out in this article in regard to the relations of the farmer to the Experiment Stations is the great help that they render the dairy interests throughout the country. All the points brought out above work for the good of the dairyman, but there is more than that. Mr. Experiment Station Man says to the dairy farmer, "Why do you keep a scrub bull at the head of your herd? The sire is half the herd, because every calf in the herd is related to him, consequently he should be the best that money can buy. Why do you keep so many poor producing cows, that barely pay for their feed, and do all this work for nothing? Keep milk and feed records of each and every cow in your herd, and you will find that about one-third of them are not paying." He then proceeds to teach the dairyman how to keep these records, and shows him the advantage of keeping a good bull and saving the heifer calves from the best cows in the herd. Some of the Experiment Stations are teaching the farmer the value of pure-bred stock, as well as the importance of keeping records of them by taking the best cows from some of the farms and making authenticated yearly tests of them at the station. Other stations have a regular corps of men that do nothing else but go from farm to farm testing and teaching the farmer to test his cows. They also teach the farmer to feed better and to put more system into his work; in other words, to become a better business man.

Experiments are being conducted all over the world on the feeding of dairy cows. The importance of these experiments are unknown to many dairy farmers, especially to those who do not keep in close touch with the work. In this day of high-priced feeds every effort is being put forth to induce the farmer to grow his own feed, and to buy only the most concentrated parts that are needed in making up an economical ration. Take the South, for instance. The dairy farmer can grow almost everything that is needed to feed his cows on, unless possibly he

could buy cottonseed meal to good advantage, which serves the purpose of feed and fertilizer as well.

Another thing that is very valuable to the dairy farmer is that the Experiment Stations are using and constantly testing, in their dairy schools, almost every make of standard cream separators. This gives the farmer a chance to see them work. The De Laval will be found in every important Dairy Experiment Station in the country, and is always a favorite with Experiment Station men.

THE VALUE OF BIRDS TO AGRICULTURE.

By JEHU L. HINSHAW, '13

The usefulness of birds to agriculture is often underestimated. They are the safeguards of our crops and our forests. Although they often eat some of the farmer's choicest fruits and grains, their service as insect destroyers will far outweigh their harm to the crops.

In order to get a clear conception of the value of birds in destroying insects, we must consider three main things: First the number and rapidity of increase of insects; next their voracity and last—the power of the birds to destroy the insects.

In considering the first of these three things we will see that there are countless numbers of insects. There are over three hundred thousand described species of insects, and in each specie there are so many that it is beyond all computation. Many of these species increase very rapidly; for example, it is estimated that if a single pair of Colorado potato beetles be allowed to increase without molestation, their increase would be over sixty millions in a single season. Mr. A. H. Kirkland has estimated that the unrestricted increase of the Gypsy moth would be so great, that the progeny of a single pair would be numerous enough in eight years, to defoliate all the trees in the United States.

Many species of insects are very harmful. Caterpillars often eat twice their weight daily. It has been noted that a single silk worm has devoured one hundred and twenty Mulberry leaves by the time it was grown. In 1904, it was estimated that the Hessian fly caused a loss on the wheat crop of over fifty millions of dollars. In the same year the U. S. Department of Agriculture reported the loss on all agricultural products caused by insect ravages as $785,100,000. One can see from these statements that the insects of our country are factors that must be considered. Some way must be found to control their ravages, the cheapest and most effective remedy is the one we want.

This is found in the protection and care of our birds. They exert a great influence in the control of insects. The report of the Biological Survey of the U. S. Department of Agriculture states that the contents of over thirty-five thousand birds craws were examined. Two hundred

and seventeen fall web worms were found in the craw of a yellow billed cuckoo and 250 ant caterpillars in the craw of another, and over 100 potato beetles in a quail's craw. Two scarlet tanagers were seen eating caterpillars of the gypsy moth at the rate of 35 per minute. They spent much of the day at it, so it is easily seen that they would eat many hundred in a short time.

The downy woodpecker that hops about the orchard and the bob white that whistles in the meadow are very useful to the farmer and should be protected. Many cases have been noted where the destruction of birds has been followed by insect ravages. Frederick the Great, King of Prussia was very fond of cherries. He saw that the sparrows were eating his fruit, so he ordered all the sparrows killed. Within two years, cherries and almost all the other small fruits were wanting. The trees were defoliated by caterpillars and other insect pests. The king saw his error and imported sparrows at a great cost. Another case is where a farmer of Wisconsin stated that the blackbirds had all been poisoned in his vicinity and the next year the white grubs were so bad that they caused him a loss of $400 on his crops.

Birds are not only useful as insect destroyers but they eat the seeds of many troublesome weeds. They are also useful as forest planters. The jay bird lends his wings to the spread of the forest by carrying acorns and other seeds.

We have seen that if there were not some restraint on the insect ravages, the wealth of the nation would continue to decrease, and that this restraint depends greatly on the number of birds. Then let us remember our feathered friends and see that they are better protected.

PRUNING GRAPE VINES

By BOYD BROWN, '14.

The grapevines at the Fruit Farm were pruned after an unusually warm wave in the latter part of February.

Two methods were used. The first of these is the drooping method. The first vine was a vigorous plant with a sturdy main stem of old wood reaching to the lower and upper wires. At the top of each were two lateral branches covered with a strong growth of new wood. All this wood was cut away except two one year old shoots, at the top of the main stems each with about a dozen buds. On the stem to the lower wire only about half so many buds were left on each new lateral branch, because of the shade. The next vine had been headed too low and required more vigorous pruning. One of last years lateral branches was tied up to the top wire and left with two short lateral branches at the top. The lower stem was long enough but seemed to be lacking in new growth so that part of last years lateral branch had to be left on one

side because no new wood could be trained in that direction. One vine was a mere stunted bush. All the branches were cut away except the two most vigorous and only two or three buds were left so that new growth would be encouraged in the right direction. The whole idea of this method is to get an old stem to each wire with two last year's shoots springing in opposite directions from their head.

The other method, known as the erect method, had a totally different purpose in view, as in the first method two old stems were trained up to the two wires but, instead of being topped here, they were carried along the wires and the new growth allowed to spring at intervals along the stem. This new outgrowth was cut back to one shoot in a place and each shoot allowed only two or three buds. When there were two or more shoots in a place, the strongest and best placed was of course always chosen. Those vines which were not strong were allowed fewer buds; also all shoots from the base were cut out. Some vines are especially bad about this.

There are variations in these two methods. The easiest managed of all is where three wires are laterally placed. The main stem tied to the center wire; and the vine trained over the outer wires as in the first method described. Or, in the erect method, the main stems may be trained diagonally up instead of along the wires. As a whole the drooping method requires less summer work with the vines, which makes it more practical for people who are busy at that time.

PRUNING APPLE TREES.

By A. B. TILGHMAN, '14

For the past few weeks the class in horticulture has been meeting at the farm where several lectures were given by Professor Keffer on pruning the apple tree. After the methods had been well demonstrated, we were given an opportunity to display our skill at the work. There are two methods for the apple tree, one is the central trunk, the other is the open top method. In the central trunk the branches come directly from the main body of the tree, but in the open top the trunk of the tree is only about two and one half or three feet high and here it branches out, giving an open top to the tree. The first trees that were pruned were young. These were pruned for the purpose of developing a well formed tree and not for the present fruit crop. All branches were cut off the body of the tree for about two and one half feet high in order to give ample room for cultivation and spraying. The limbs should stand well proportioned around the body of the tree so that one side will not have to bear all the weight of the fruit. No limb should stand directly over another, since, the amount of fruit greatly depends upon the amount of light that the fruit buds receive; it is very necessary that no branch

should cut off the light from another. The older trees were pruned much more in the top than in lower branches, this enables the light to reach the lower branches. Since the lower limbs do not shade any other branches, it is not necessary to cut out so many of these. The branches that come out from the under side of a limb should be cut out. Every limb that runs across in the space that is allowed for another was cut out. By this means every branch has a territory of its own and is not crowded out by the other branches.

THE MEXICAN COTTON BOLL WEEVIL.

By N. F. HANSON, (Special)

The Mexican boll weevil has developed in less than twenty years from a most obscure species to one of the most dangerous in the world. It was not until 1894, that its presence in Texas came to the notice of the Bureau of Entomology. It was known in Mexico some time previous to this and in 1848, in the vicinity of Coahuila, the cultivation of cotton was practically abandoned on account of the growth of the weevil. The exact date at which the weevil crossed the border into Texas is uncertain. It first put in appearance at Brownsville in 1892, and in 1894, was spread over several counties. It was at this time that it was brought to the attention of the Bureau of Entomology and it was suggested then that a belt be established along the Rio Grande, along which there would be no cotton grown, as the most practical and economical means of checking the advance of the weevil. This suggestion was not acted upon and the weevil has gradually extended until five states are infested. At the present time the weevil is found in Texas, Louisiana, Mississippi. Arkansas and Oklahoma. In 1908, the greater part of Texas and Louisiana, eighteen counties in Mississippi, twenty-eight counties in Arkansas and about one-fifth of Oklahoma were infested; in all about 225,000 square miles or about thirty-six per cent. of the cotton acreage of the United States. The total loss to Texas alone every year has been $22,500,000. Where the weevil is not controlled to some extent, there has been a reduction of fifty per cent. of the cotton crop. In the more moist counties the damage is greatest. In prairie regions where the weevil obtains little protection in the winter, they never become as numerous as in sections where the hibernating conditions are favorable. Along about the middle of August, the weevil begins to migrate. They never travel in one direction, although their movement is governed to some extent by the winds. They fly into hedges, woods, cornfields, haystacks, farm buildings, or other places. Many of them find hibernating quarters without leaving the cotton fields. These crawl into cracks in the ground, under grass, weeds and other trash. Many thousands per acre have been found in such situations. There is less protection here than in more favorable places, and the mortality during the winter is greater.

As the weevils increase very rapidly it is necessary for the farmer to use the utmost caution in checking the growth as much as it is in his power. It has been found that during a season beginning on June 20, and extending to November 4, the progeny of a single pair of weevils is 12,755,100. The cotton boll weevil, as far as known at the present time, has no food other than cotton. The age to which weevils live varies under different conditions. The longevity is much greater in winter than in summer. During the summer the majority of the weevils live about sixty days. During the cooler part of the year they may live as long as six months. While the reproduction of the weevils is very great there are various agencies that serve to prevent such excessive multiplication. Heat is an important factor in the checking of the rapid growth of the weevils. As has been mentioned before, in prairie regions the damage is not very great. Where there is no shade practically all of the immature weevils are killed. Insect parasites also play an important part in the destruction of the immature weevils. They deposit their eggs on the immature weevils in the boll and the young parasites develop by feeding upon them. Again there are about twelve species of ants that prey upon the young weevil. The most common are the little brown and yellow ants that are frequently found in cotton fields.

It is possible for the farmer to control the weevil to some extent on his farm. The fact that the weevil moves about but little except at one season of the year, is of great benefit to the farmer. As the movement occurs after the crop is practically made, the arrival of weevils from other infected regions will have little effect. Foremost among the methods of control is the killing of the adult weevils that are ready to enter hibernation in the fall and the prevention of the development of millions that would emerge later in the fall. This is accomplished by the burning of the infested plants in the fall. There are many reasons why the plants should be destroyed, among these are:

1. Many adult weevils are killed outright.

2. Hundreds for each plant in an immature stage are killed.

3. The few adult weevils that escape will be weakened by starvation and will not be able to survive the winter.

4. The removal of the infested plants will facilitate fall plowing. The weevil in the fall is practically at the mercy of the farmer as at no other time of the year and he could employ his time no better than by cleaning his fields thoroughly, removing all grass and weeds from fence corners, and the removal of all other rubbish on the farm that could serve as a protection for the weevils during the winter months.

THE RELATION OF TYPE TO BEEF PRODUCTION.

By C. E. ALLRED, '12.

Good feeding steers have been very high in price for some time now, and some writers are advising the feeding of a poorer grade; but owing to the correspondingly high prices of feed stuffs this is no more profitable now than at any former time.

There are really six market classes of feeders: Fancy selected, choice feeders, good feeders, medium feeders, common feeders, and inferior feeders. Now let us take, say choice feeders and inferior feeders and compare them. The choice feeder has the parallelogram form; broad, straight, well proportioned back; short neck and legs; fine hair; soft skin; and well sprung ribs. He has withal a general beefy appearance. The scrub always lacks several, and may lack all, of these characteristics.

Now there are cases on record in which a scrub has gained more pounds in weight on the same amount of feed than did a pure bred. For instance, at the Pennsylvania Experiment Station a scrub gained 1.8 pounds on 13.3 pounds of feed, while a pure bred required 13.6 pounds of feed to gain 1.1 pounds. And yet in this case the pure bred steer was the more profitable because his meat was of better quality and was placed on high priced cuts. On the other hand, there have been many experiments in which the pure bred not only produced the better quality of beef, but the most pounds. For instance in one case it required seven and one half pounds of grain to produce one pound of increase in the pure bred, while eight and one half pounds were required in the scrub.

The market of today has become a very discriminating one, and it is quality and not quantity in a steer that makes him profitable. The steer that lays on thick, even layers of well marbled flesh in the rounds, loins and short ribs is the one that brings the highest price. The scrub is inclined to put on internal fat around the intestines and stomach; to be heavier before than behind; or to use up much of the energy gotten from the food in the formation of large bones. (There is seven per cent. more waste from Jersey, than from Angus cattle). Any of these characteristics are undesirable.

Many scrub steers are long legged and slim bodied, and therefore have but small digestive capacity. It stands to reason that a steer of this type cannot consume and assimulate as much food as one having a large, well developed digestive capacity, and so will not gain so fast.

Many scrubs, also, are of the dairy type and have dairy blood in them; now the dairy breeds have been for many generations bred to produce as little meat as possible and as much milk; also they have been bred to the wedge type which is light behind. So it is against the inbred characteristics of this type of steer to put on flesh where it is most profitable to the feeder.

The docility of the pure bred beef steer is much in his favor. The nervous system has been very highly developed in the dairy breeds and

any scrub having dairy blood, as most of them do have, is likely to be more or less nervous. And it has been shown that every time a steer is scared, or moves around unnecessarily it is at the expense of his gain in flesh.

Early maturity is another point in favor of the pure bred. If a steer can be made to grow and fatten at the same time, thus finishing off early he is much more profitable than one which must be fed till he is mature and then fattened. And besides that the beef from young animals is worth on the market about $1.50 more per hundred pounds than is the beef from old animals.

While of course it is the individual type of steer that should be selected, and the right type of steer from any breed will make good gains; yet many feeders select each lot of only one breed, and by this selection of pure bred steers of some uniform type and color they are able to command prices relatively higher than could be secured for a bunch of scrubs of mixed type and color.

Thus, considering all phases of the question, beef can be much more profitably produced with a pure bred steer, which is of correct type, than from a scrub which is of poor type.

PRUNING PEACH TREES.

By G. E. SHELBY, (Special).

In pruning peach trees the main object of the Pruner should be to secure and maintain a uniform and open crown. The reason for desiring this open crown is based on the fact that the entire crop of fruit buds is limited to one year old growth, and it is necessary that this one year growth be located as near the base of the tree as possible in order to lighten the strain on the limbs and the food supply. To secure this one year growth on the shortest possible branches they must be well supplied with an abundance of sunlight and a free circulation of air.

The best way to secure this type of tree is to begin your pruning operations with this object in view: When the tree is first planted, cut back the main stem to within two or three feet of the ground and remove all side branches below this.

After the first years growth all water sprouts are removed except three or four around the top of the main stem that are about equidistant from each other. These are cut back to within about one foot of the main stem making the tree resemble an inverted tripod. At the third pruning the growth on these stubs are pruned about the same as that the year before on the main stem. This general method is followed except that after the third year you allow some of the water sprouts to grow as fruiting wood.

When the trees get old it is necessary to cut out the undesirable two and three year growths and the excess one year growth to maintain the

open crown. This generally consists of branches growing toward the center of the crown or those interfering with other branches and the weaker unprofitable branches which generally grow on the under side of a large branch. In order to maintain a uniform and balanced crown it is necessary to cut back or remove all branches that have a tendency to make a long slender growth.

In trees six or eight years old it is often necessary, in order to prevent excessive lengths of branches and to rejuvenate the tree, to cut back all branches to within three or four feet of the main stem. This can best be done, in years following a heavy fruiting season or when frost has destroyed the crop, without any appreciable loss of fruit.

SHORT COURSE PRIZE AWARDS

The 1911 Short Course in Agriculture developed the highest standard of work on the part of the farmer-students that has yet been attained. The total attendance for the two months of the course was about sixty. Of these, about thirty took the full course, the remainder taking only the work in agronomy and animal husbandry during January. In age the students ranged from seventeen to fifty, and throughout the course the greatest interest was manifested, both in the lectures and in the practical exercises in field, orchard, feeding lot and barns.

The following list of prizes were awarded in the various subjects:

$10.00, for proficiency in feeds and feeding, given by J. Allen Smith & Co., Knoxville. Awarded to A. R. Fryer, Goodlettsville.

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One pure-bred Berkshire pig, for proficiency in breeds and breeding, given by J. D. B. DeBow, Nashville. Awarded to J. T. Woodson, Gallatin.

One corn sheller, valued at $25.00, for proficiency in home-grown rations for dairy and beef production, given by the International Harvester Co., Knoxville. Awarded to M. L. Brown, Knoxville.

One 2-horse plow, for proficiency in soils, fertilizers and crops, given by the Wm. J. Oliver Manufacturing Co., Knoxville. Awarded to A. C. Woodard, Springfield.

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$10.00 for proficiency in judging light horses, given by Judge Edward T. Sanford, Knoxville. Awarded to Bernard J. Condon, Knoxville.

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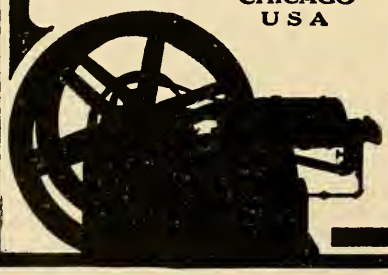

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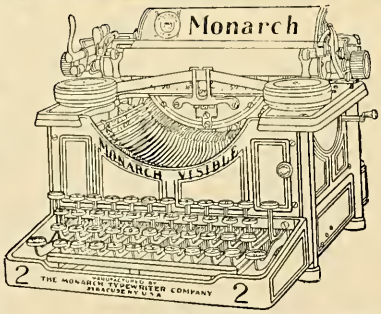

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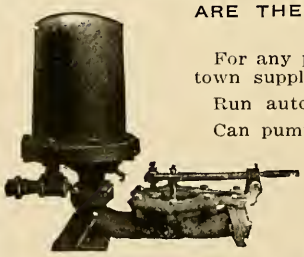

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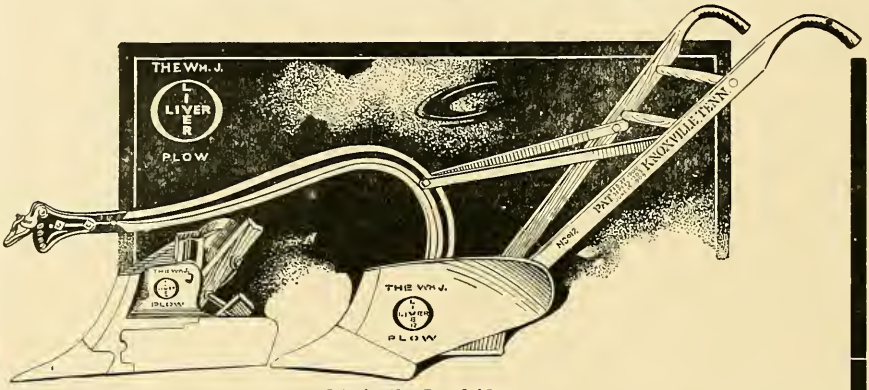

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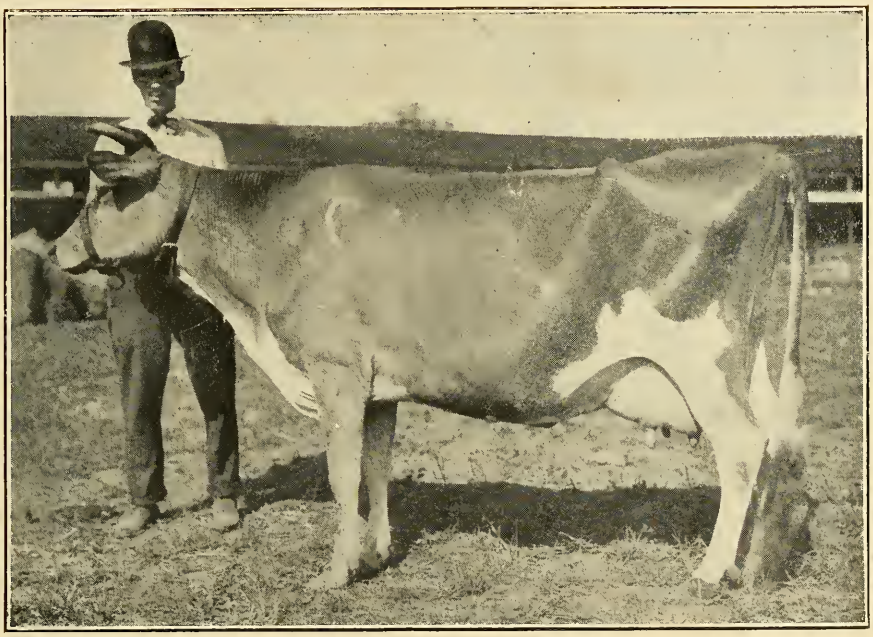

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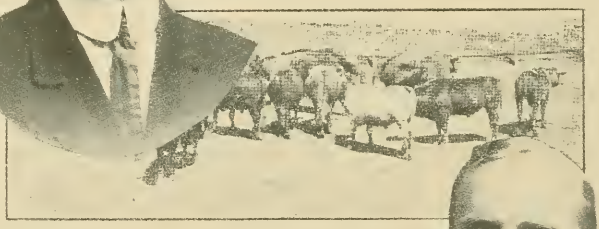

SCENES ON UNIVERSITY FARM

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EDITOR.

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THE U. T. FARMER

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PLANTING AN ORCHARD AT CRANBERRY, N. C.

By R. H. FELTS, Jr., '12.

On the invitation of Mr. F. P. Howe, of the Cranberry Iron Co., the Junior Class in Horticulture, under the direction of Professor Keffer, went to Cranberry, N. C., and laid out an orchard of a thousand trees, the initial planting of what is destined to be a large commercial orchard.

On April 1, Professor Keffer received a message from Mr. Howe, stating that the trees had arrived. The class left Knoxville at 1:35 a. m., April 4. Adsmond, Morton, Thompson, and I packed our suit cases with work clothes, secured our railroad tickets and Pullman reservations, and went to the Southern Railway Station about 11:30 p. m., on the third of April, and took our places in our little six feet of bed.

HORTICULTURAL STUDENTS ON SPECIAL TRAIN.

We were awakened next morning and told to dress for Johnson City. When we stepped from the train at 6 o'clock, the first to meet our eyes was the smiling face of our instructor, who had delivered a lecture before a corn club at Jonesboro the day before, and had gone up to Johnson City that night. We were easily tolled through the rain to the Colonial Hotel, where a delightful breakfast was served. Scarcely

had we completed our repast, however, when we were warned that our train was waiting for us. We went at once to the E. T. & W. N. C. Depot and boarded a special train for Cranberry.

The road passes Sycamore Shoals, where our pioneer forefathers gathered, prior to starting for King's Mountain during the Revolution. The birthplace of "Bob" Taylor is near the Shoals and in sight of the road. The scenery through the Dol River gorge is as fine as anything in the Eastern mountains.

At Cranberry we went to the Mitchell House, and while Professor Keffer and the farm foreman inspected the orchard site, we boys donned our work clothes and visited the mines and were shown through by one of the men.

At dinner Adsmond took possession of the dish of prunes and never once during our stay was one of us able to get a prune.

The meal finished, we started for the field we were to convert into an orchard, and although it was raining and cold, we began our work. The field we found to be a hillside sloping to the northwest, and it was decided to use the contour system of planting. After working for about two or three hours, it became apparent that the instrument we were using was very inaccurate, and the rows were not assuming the position they should. Being unable to correct the error in the transit, we inquired if there was another instrument in the neighborhood and were told there was a surveyor who lived across the mountain, but it would be impossible to get him before next day.

Laying out the Orchard Site.

After the evening meal, all of us gathered in one room and spent the early hours of the night in varied amusements, retiring about 11 o'clock. Next morning, we were up and had breakfast by 6 o'clock. It was still raining, but we were becoming accustomed to it now, and

went on to our work. The old mountaineer "surveyor" was there with a level balanced on a single stick, and in about three minutes we saw he was of no assistance to us. Being unable to obtain an accurate instrument, we were forced to give up the idea of planting by contour's and began work by the hexagonal system.

First, base lines were run across the field north and south and east and west, and at intervals of twenty feet short stakes were set marking the places of the trees in these rows. Now, with the first stake as a center and a radius of twenty feet, an arc was described, then with the second stake as a center and the same radius, another arc was described, the point of intersection of these arcs designated the place for the first tree in the second row. Then with the second and third stakes as centers and radii of twenty feet, arcs were described marking the place for the second tree and so on, each tree was located in the second rows, running both north and south and east and west. When the west side of the field was reached, the first three trees in each row down that side were determined in this manner. Tall stakes were now set directly back of each short stake in the first row on the east and west sides, and the remainder of the stakes were set by sighting from the end of the rows and diagonally across the field, one man sighting from the end, one diagonally, and a third setting the stakes where indicated by the other two. In this way the trees were aligned in three directions, making it possible to cultivate in three directions if it is desired to do so.

Bright sunshine greeted us the third morning—until then we had worked in rain or drizzle constantly. With our coats off and sleeves rolled up, we set to work and were nearing the completion of our work at noon.

After dinner we inspected the trees. All were found to be free from San Jose scale and Wooly Aphis, but they were badly infected with crown gall. Of the 1,040 trees, 354 were dicarded and instructions were given not to plant any of them.

The advantages of the hexagonal system are shown by the fact that cultivation in three directions is made possible, light is better distributed among the trees, and more trees are put on the same amount of land than by any other system, while at the same time each tree is twenty feet from the one nearest it. The following diagram will show the main points of the system:

In the diagram, the places marked P. represent permanent trees, and those marked F. represent filler trees, which are some variety which will come into bearing early and are to be cut out later. The permanent trees are of a variety which do not come into bearing as early as the filler trees, and when time comes to cut out the fillers they are in their prime.

In this orchard we used the variety known as Delicious for fillers and York Imperial and Grimes Golden for permanent trees.

In order to place the tree in the exact spot where the stake was

placed, we had a "planting board" made. It is merely a board about six feet long and six inches wide, in the center of which a notch is cut in one side, and near each end a small hole is bored. The board is placed so that the stake fits into the notch of the board and small pegs are stuck into the ground through the small holes in the ends and the board is lifted. The hole is dug for the tree, the board placed in the same position as before, and the tree placed in the notch and soil packed around it.

After showing the foreman how to employ this method and planting a few of the trees, we left him to plant the remainder of the orchard.

Next day we boarded the train for Roan Mountain Station, intending to climb to the top of Roan Mountain, twelve miles away, but when we arrived there, owing to the difficulties of getting out to the mountain, we abandoned the idea. We then decided to climb Orr's Mountain, which stands about 1,200 feet above the station. While on this tramp we inspected two orchards, which we found on the mountain, and were surprised to find that the soil on top of this mountain was of excellent quality.

We returned to the station in time to enjoy a good dinner at Roan Mountain Inn. Soon after dinner we boarded the train for Johnson City, and upon our arrival each of us went to a barber shop and was shaved for the first time since leaving Knoxville.

After a good supper at the Colonial, we "took in the town" until 11:30, when we boarded the train for Knoxville and were soon in our berths and asleep, waking only in time to dress before arriving in Knoxville, at 6 o'clock next morning.

Each member of the class feels deeply indebted to Mr. Howe for this excellent opportunity of doing some practical work in horticulture.

THE RELATION OF TYPE TO DAIRY PRODUCTION .

By JUDD BROOKS, '12.

Dairying is one of the most important industries of the United States. The importance of dairying is shown by its steady increase. This increase is given in the 1910 year Book of Agriculture to be as follows: In January, 1867, there were 8,394,000 dairy cows in the United States, with a farm value of $239,747,000. In 1877, there were 11,261,000, with a farm value of $286,778,000. The number in 1887 was 14,822,000, with a value of $318,790,000. It had increased to 15,924,000 in 1897, and in 1910 there were 21,801,000 dairy cows, with a farm value of $780,308,000 in this country. But, according to the United States Census report of 1900, the annual production per cow was 3,600 pounds of milk, or 125 pounds of butter. At $1.25 per hundred pounds for the milk or 25 cents per pound for the butter, they yielded $45.00 or $37.50 per cow, respec-

tively. The cost of food per year was reckoned at $40.00 for each cow. From this report and others, the Experiment Station, with the aid of the United States Agricultural Department, set to work in order to find the reason for such low production of dairy products.

The dairy investigators have found that ordinary dairymen are retaining unprofitable cows in their herds and the reason for this is largely due to their not knowing the relation of type to dairy production. The Tennessee Station investigated twelve herds, consisting of 298 cows, and found 224 of that number to be of an inferior dairy type, falling below the standard of 250 pounds of butter fat per year. The remaining 69 cows were more of the dairy type, and produced from 250 to 450 pounds of butter fat annually.

The Connecticut Experiment Station investigated 47 herds, and out of that number, only one herd was found that produced on an average of 250 to 300 pounds of butter fat annually. The remaining 46 herds were of the inferior dairy type, and were not profitable herds.

Suppose the cows of one herd are considered: The Connecticut Station herd of 25 cows, consisting of 4 Jerseys, 4 Ayrshires, and three Gurnseys, all registered, and 14 grade cows of different breeds, was put on a year's test in order to determine definitely the relation of type to dairy production. These cows would differ little from those of the ordinary dairy herd. Accurate records were kept of the amount and cost of food consumed, and the quantities and qualities of milk and butter produced for the year. The feed was weighed for each individual, and the milk of each cow was weighed and tested with the Babcock test. In the end, there was a great difference in the production and cost of maintaining the different types included in the herd. It would require too much space to enumerate the results of each individual of the herd, and for that reason numbers 2 and 22 will first be used to show the striking relation, type has to dairy production.

Cow No. 2, a registered Jersey of the dairy type, having a fine head and neck, sharp withers, spare crops, prominent and ridged backbone. Her front quarters, light with fine bone, hind quarters, large and spare, with high arching, flank; thin incurved thighs, large, soft udder, with well placed teats, and a large barrel, with well developed digestive organs. She had a strong heart and circulation to furnish a large blood supply to the udder; strong lungs, a highly developed nerve system, and a general absence of superfluous flesh.

Cow No. 22, a grade Jersey, having calved only a few weeks before being put on the test, was at her best as a dairy cow. Her milk tested from 5.5 to 7.5 per cent with the Babcock test, and shows where the dairyman who uses the test without the scales may be mislead. She was characterized by a thick neck, full crops, round withers, full brisket, and heavy front and rear quarters. Her back was well covered with flesh, and the udder was lacking in softness and size. The barrel in-

dicated the capacity of storing and disposing of large amounts of food, but the general type of the cow indicated that she would convert the food into flesh rather than into dairy products—she was of the inferior dairy type.

The cows consumed about equal amounts of food. The cost of food for the cow of dairy type was $48.80, while that of the inferior type was $40.77. The dairy type produced 509 pounds of butter, sold at 18 cents per pound, showing a profit of $42.82, and the inferior type produced 257 pounds of butter at a profit of $5.49. Cow No. 2 produced 8,465 pounds of milk, or a profit of $35.85 when marketed at $1.00 per hundred, and the cow No. 22, produced 3,629 pounds of milk at a loss of $4.48. The cost of feed required to produce one pound of butter by the dairy type was 9.58 cents, while that of the inferior type amounts to 15.80 cents. Food required to produce 100 pounds of milk by the dairy type cost 58 cents, and that of the inferior type $1.12.

It is natural for some dairymen to say: "That if both cows used in this example had been pure-bred, they would have been economical producers and there would have been no difference in type." That is not always the case with pure-bred dairy cows, as was shown in the same Connecticut Station herd. Cow No. 23, a registered Jersey, of inferior type, produced 276 pounds of butter at a profit of $3.47 for a year, while cow No. 2, a registered Jersey of the dairy type, produced 509 pounds of butter at a profit of $42.82 for the same length of time. No. 25, an Ayrshire of inferior type, produced 172 pounds of butter at a loss of $4.09, and 3,826 pounds of milk at a profit of $3.21, while No. 11, another Ayshire of the dairy type, produced 375 pounds of butter at a profit of $20.44, and 8,249 pounds of milk at a profit of $35.43. No. 20, a Gurnsey of inferior type, produced 246 pounds of butter at a profit of $4.92, and 4,122 pounds of milk at a profit of $1.86, while No. 7, another Gurnsey of the dairy type, produced 357 pounds of butter at a gain of $22.08, and 6,435 pounds of milk at a gain of $22.17.

From the foregoing, it is evident that there is a great difference in productive capacity of the different types of dairy cows, whether Jerseys, Ayshires or Gurnseys. It can be clearly seen from the above data, that in order for a cow to be profitable, she must produce at least 6,000 pounds of milk and 250 pounds of butter fat annually. The cows of the spare type have been found to be profitable by each of the Experiment Stations.

Since type has such a distinct relation to dairy production, the farmers and dairymen of Tennessee, as well as those of other states, can and should improve their herds by weeding out the unprofitable, inferior type of cow. It means more money for the individual farmer; more money for the farmer means more money in the state. A richer state should mean better farms; better homes, better schools, and a better state.

TRANSPLANTING.

H. A. HIBBEN, '14.

There is always a great deal of transplanting to be done on every farm. There is, of course, more upon some farms than upon others. For instance, upon a truck farm, there is a very large amount of tomatoes, cabbage, etc., to be transplanted, while upon a grain or stock farm there may be comparatively little.

Some plants may be transplanted directly from the hot bed to the field, the most common of this class being the sweet potato. In this particular case, it is almost a necessity to do this, because of the large amount of time required for the work. On a great many farms, tomatoes, cabbage, etc., are transplanted in the same way.

Better results are obtained, however, when the young plants have been transplanted two or three times in pots before being set permanently in the field. The principle advantage is gained by the concentration of the root system of the plant. The pots should not be too large. It is better to transplant the young plant an extra time or two as needed than to put it into a pot that is too large and let it grow to it. Where the pot is too large, there will not be so many roots, but they will be longer, which is just contrary to the object of potting. Where the plants are allowed to grow in the bed where sown, they are crowded and the tops grow very spindling. The roots go deep into the soil and when the plant is taken up to be transplanted, it leaves most of its root behind. By the potting system, the plants are separated so that their tops have plenty of room, and they also gain the concentration of root system. With these two advantages, the plant that has been potted will often stand the final transplanting much better than the plant that has not.

Care should be taken about the potting soil. It should contain plenty of plant food and be firm enough to pack nicely, but should still be porous enough so that it will not form lumps when pressed. The best of potting soils can be made from old hot bed manure, garden loam, clay and sand. They are usually mixed in the proportion of two parts of manure, one of clay, one of sand, and one of loam. These proportions are not always right, owing to the different formation of the loam and clay. When freshly mixed, the potting soil should hold its shape when compressed in the hand and yet should crumble easily. If it does not hold its shape, more clay is needed; if it does not crumble readily, it needs more sand. With a little practice the soil is mixed with very little trouble.

RELATION OF RAINFALL TO CORN PRODUCTION.

D. A. RUSSELL, (Special)

Is there any reason why Tennessee should not produce as many bushels of corn per acre as any other state in the Union?

No! Then you may ask why we do not produce as many bushels per acre.

One of the first and most important reasons is that we try to farm like our northern brothers, who have different conditions. In the North Central Corn Belt the rainfall is of a different type than that found in Tennessee. The states of Ohio, Indiana, Illinois, and Iowa have an average rainfall of 20 inches and Tennessee an average of 25 inches during the six growing months—March 1st, to August 31st. But it should be remembered that the rainfall of the Corn Belt is of a different type. In this Corn Belt they have a dry fall, winter and spring, but a wet summer. July and August have the heaviest rainfall of the year, and it is these wet months that make the heavy yields of corn. Conditions in Tennessee are quite different. We have our heaviest rainfall in the winter and spring with two dry spells in the growing season—May and August.

From a study of the rainfall of Tennessee, it is readily seen that we must abandon our old way of farming and take up the new "scientific methods." Before we can compete with the Corn Belt in the production of corn, we must adopt a cropping system which will coincide with our rainfall and our climatic conditions. Tennessee is especially adapted for intensive farming or for the double cropping system. This double cropping system gives the farmer an opportunity to preserve water and add humus to his soil by growing and turning under winter cover crops such as, crimson clover, vetch, wheat, and barley. It is by turning under such crops that we pay the soil for what we get. A few farmers think it a waste to turn under a crop of wheat and vetch, that would make two tons of hay per acre. But this is far from the truth, for when such a crop is turned under our preceding corn crop is raised from 30 bushels to 70 bushels. Last year on the Tennessee Experiment Station farm, the yield was over 100 bushels per acre where a green crop was turned under in the spring. The cover crop not only adds humus to the soil but it prevents losses of food elements in the winter drainage. If the cover crop is there on the soil it will use the food elements as they become available instead of allowing them to be drained off through surplus water. Another important factor causing a low yield in corn production in Tennessee, is shallow plowing and the improper making of a seed bed. Any land intended for corn should be plowed at least 9 inches deep—deeper the better. A soil well worked 9 inches deep will hold 113 tons of water per acre, or a rainfall of one inch. Hence we see the need of deep plowing and plenty of humus to hold a sufficient amount of water to tide our growing corn over the dry months of May and August, which

frequently reduces our yield to 20 bushels. Under our modern scientific method of farming it is easy to get 70 bushels. So brother get in the habit of sowing cover crops, and we will all try our hand on the double crop system, which means two crops per year and occasionally one to turn under for our big corn crop.

TOBACCO—PREPARATION OF THE SOIL AND TRANSPLANTING.

By G. B. THACKSTON, '14.

The first and most important step in producing a crop of tobacco after the plants are secured is a well-prepared seed-bed. The soil should be rich, loose, and well-drained. Virgin soil is very good, also blue-grass, clover, or timothy sod, but such soil necessitates late transplanting to avoid the destruction of the crop by cutworms, and it must be turned in the fall or early spring in order to allow the sod to rot.

For fertilizers, accumulations of ashes, tobacco stalks and scraps may be scattered over the ground before harrowing. Probably the best commercial fertilizer is sulphate of potash. Muriate of potash is not good, as the chlorin in it is considered injurious to both the growing plant and the manufactured article. For dark tobacco, where weight and body are demanded, barnyard manure is excellent, but it is not to be recommended when fancy, light Burley tobacco is desired. The manure should be spread while the ground is frozen, so that it will be well rotted before cultivation begins.

The land should be plowed as early as possible, double-disked, and allowed to lay until about a week or ten days before transplanting, so as to allow all turf to become well rotted. It should then be turned from eight to ten inches deep. If it turns up very cloddy, the disk should again be used and then the drag-harrow may be used effectively. Harrow in all directions, not once, but many times, until there is not a clod to be seen. It may then be rolled. Too much emphasis cannot be placed upon the preparation of the soil. As Professor Morgan says: "The crop should be cultivated before it is set out." Thorough preparation now will save much cultivation later, and if the soil is not in the best condition, the plants will not grow off quickly, the weeds are liable to get the start of them and they will always look pale and sickly.

After the soil has been well prepared, the next step is the laying off of the ground for transplanting. Nearly every grower has a different method for this. The best implement for this is the bull-tongue plow with two horses, and some like to run through the furrow with a double-shovel with the hoes off, making a small ridge in the middle of the furrow to set the plants on. Others say, however, that this allows the plants to cover up worse when cultivating the first time, and advise setting the plants on the side of the furrow made by the bull-tongue. The rows should

be from three and a half to four feet apart, and the plants eighteen to twenty-four inches in the rows, varying with the richness of the soil. Some plant three and a half to four feet each way and cultivate in both directions, but this is too far, as it has a tendency to produce a coarseness of fibre that is undesirable.

Transplanting is usually done from April 20 to May 15, but of course the date of planting varies in different regions. There are two methods of transplanting—by hand and by planter. The old method of transplanting by hand is done where there is considerable moisture in the soil, and the other in dry weather. In the old method the plants are pulled from the bed immediately after a rain and taken to the field. A small peg is used for setting out the plants. A hole is made with the peg, the roots of the plant thrust in, and the dirt firmly pressed around the plant. One person can drop for two setting out, and with good planters can get along very fast.

Where there are large fields the two-horse planter is used to some extent. This can only be used in dry weather, and, of course, water must be supplied to keep the plants from dying. Large growers claim that a greater percentage of plants will live when set out by a planter than when set out by hand, but the writer prefers the hand method, having gotten a stand of from 96% to 98% by this method.

After transplanting, nothing should be done to the plants for from a week to ten days, except to go through the field and re-plant any that have died or been killed by cutworms. This is to allow the plants time to take root. A small weeder or harrow should then be run between the rows, followed in a few days by a shallow plowing and hoeing. After this, no set rule can be made regarding cultivation, as almost every farmer has his own method.

THE EAST TENNESSEE FARMERS' CONVENTION AND INSTITUTE PROGRAM.

The 38th annual meeting of the East Tennessee Farmers' Convention and Institute will be held at the University, May 16, 17 and 18. In addition to the general program, there will be four separate sectional programs, devoted, respectively, to the subjects of Live Stock, Dairying, Horticulture, and Home-making. The general and sectional programs are as follows:

GENERAL PROGRAM.

Jefferson Hall.

First Day, Tuesday, May 16.

Morning Session.

9:00—Call to order by the President, W. R. Reeves, Jonesboro. Opening services. Federation of Churches of Knoxville.

9:15—Address of welcome, Dr. Brown Ayres, President, University of Tennessee.

9:30—Response, John W. Cate, Cleveland.

9:45—President's annual address.

10:10—Address, Hon. John Thompson, Commissioner of Agriculture, Nashville.

10:40—How Can the Farmers' Convention and Institute Assist in the Development of the Departments of Agriculture and Home Economics in Our Normal Schools? Prof. S. G. Gilbreath, Johnson City.

11:00—Shall Each County Have a High School, With Land and Equipment for the Teaching of Agriculture? Prof. Adams Phillips, Concord.

11:30—A Convention Hall and Live Stock Pavilion, County Vice-Presidents.

11:50—Appointment of committees.

Evening Session.

7:30—What Benefits Does the State Derive from the Seed Inspection Law? Prof. S. M. Bain, University of Tennessee.

8:00—Cement Resources and Possibilities (Illustrated), Dr. C. H. Gordon, University of Tennessee.

8:30—How Can Farmers With No Income Except From the Farm Best Reclaim Poor, Worn-out Soil? (Open discussion).

Second Day, Wednesday, May 17.

Morning Session.

9:00—Opening Services.

9:15—The Farmer's Church, Dr. Warren H. Wilson, New York.

9:45—Live Stock in Relation to Soil Fertility, Director R. S Shaw, Michigan Experiment Station, Agricultural College, Michigan.

10:30—Home-making of Fertilizers, and Use of Lime and Fertilizers in Crop Rotations, for East Tennessee Farms, Prof. C. A. Mooers, University of Tennessee.

11:30—The Successful Production of Alfalfa in East Tennessee, Prof. H. A. Morgan, Tennessee Experiment Station, Knoxville.

Evening Session.

7:30—The Growth and Care of Farm Timber, Prof. C. A. Keffer, University of Tennessee.

8:00—Good Roads, with Special Reference to the Building and Maintenance of Macadam and Dirt Roads.

Third Day, Thursday, May 18.

Morning Session.

9:00—Opening Services.

9:15—(a) Lime: Burnt Lime: Kilns, Burning, and Application, A. M.

Glasgow, General Manager Tennessee Marble-Lime Co., Knoxville.

9:45—(b) Crushed Lime Rock, O. P. R. Fox, Morristown.

10:15—Discussion.

10:45—Factors in Permanent Soil Development, Prof. C. G. Hopkins, Illinois Experiment Station, Urbana, Ill.

12:00—Adjournment.

LIVE STOCK SECTION.

Jefferson Hall.

First Day, Tuesday, May 16.

Afternoon Session.

1:30—Silage for Beef Cattle, A. M. Worden, Tullahoma.

2:00—Some Experiences With Hog Cholera Serum, W. M. Landess, Fayetteville.

2:30—Feeding Cattle on Grass (Open discussion).

3:00—Spring Lamb Production for Tennessee, R. W. Clark, Shelbyville.

3:45—Results of Steer Feeding at the Tennessee Experiment Station, Prof. C. A. Willson, Animal Husbandman.

4:30—Demonstration in the Judging of Beef Cattle, at Jefferson Hall.

Second Day, Wednesday, May 17.

Afternoon Session.

1:30—Hogs and Their Economical Management, Dr. Tait Butler, Starkville, Miss.

2:15—Types and Methods of Sheep Farming, Director R. S. Shaw, Michigan Agricultural College, Agricultural College, Michigan.

3:00—Open Discussion.

3:15—Draft Mares for Farm Use and Mule Production, Prof. Wayne Dinsmore, Secretary of the Percheron Society of America, Chicago, Ill.

4:00—Discussion, led by D. D. Hix, Shelbyville; D. S. Combs, Hickory Valley.

DAIRY SECTION.

Basement of Morrill Hall.

First Day, Tuesday, May 16.

Afternoon Session.

1:30—How to Reach the Farmer With Dairy Information, Prof. J. J. Hooper, University of Kentucky, Lexington, Ky.

2:15—Producing Milk for the City Trade, J. O. Schaad, Knoxville; O. D. Haddox, Knoxville. L

2:45—Planning Rotations and Rations for the Dairy, S. E. Barnes, Knoxville.

3:15—Discussion.

3:30—Types of Dairy Cattle as Related to Geographical Location, Feeds, and Manufacture of Product, B. H. Rawl, Dairy Division, Bureau of Animal Industry, United States Department of Agriculture, Washington, D. C.

4:00—Cement on the Dairy Farm, Dr. G. H. Gordon, University of Tennessee.

4:30—Butter Contest.

Second Day, Wednesday, May 17.

Afternoon Session.

1:30—Training of Cows for Increased Production, Prof. J. J. Hooper.

2:00—Discussion.

2:15—Co-operation in the Disposal of Dairy Products, B. H. Rawl.

3:00—Controlling Temperatures of Milk on the Farm, S. E. Barnes.

3:45—Herd Records Essential in Determining Dairy Profits, C. A. Hutton, Maryville.

4:15—Discussion.

4:30—Demonstration in the Judging of Dairy Cattle, at Jefferson Hall.

HORTICULTURAL SECTION.

Room 205, Morrill Hall.

First Day, Tuesday, May 16.

Afternoon Session.

1:30—The Home Canning Industry: Crops, Methods and Markets, J. W. Crowder, Kingston.

2:00—Irish Potatoes: Culture and Marketing, C. R. Coleman, Knoxville.

2:30—Sweet Potatoes: Storage and Winter Market, J. T. Allen, Fountain City; W. C. Shaw, Harriman.

3:00—The Strawberry in the Dayton District, J. D. Ellis, Dayton.

3:30—Cantaloupes, J. V. Shipley, Bluff City.

4:00—Watermelons, A. D. McCampbell, Knoxville.

Second Day, Wednesday, May 17.

Afternoon Session.

1:30—Some Diseases of Vegetables, Prof. S. M. Bain, University of Tennessee.

2:00—Truck Farming in the Norfolk District (Illustrated), Prof. L. C. Corbett, U. S. Department of Agriculture, Washington, D. C.

2:30—What the Trucker Should Know About Weather, J. F. Voorhees, Weather Bureau, Knoxville.

3:00—Apple Growing, A. L. Hopson, Washburn; Henry Kehr, Gatlinburg.
3:30—An East Tennessee Peach Orchard, Ross Smalling, Watauga.
4:00—Sources of Plant Food, Prof. C. A. Mooers, University of Tennessee.

HOME-MAKING SECTION.

First Floor, Carrick Hall.

First Day, Tuesday, May 16.

Afternoon Session.

2:30—The Organizing of Farmers' Wives for the Betterment of the Country Home, Mrs. Clara Boone Mason, Prospect.
3:00—Dialogue: The Ideal Country Home, Mrs. J. A. Reagan, Sweetwater; How the Other Half Lives, Mrs. Chas. O. Browder, Sweetwater.
3:45—Inspection of Home Economics Department of the University of Tennessee, in Barbara Blount Hall.

Second Day, Wednesday, May 17.

Morning Session.

11:00—How to Interest the Children in Animals, Dr. Asa A. Schaeffer, University of Tennessee.
11:30—Demonstration and Lunch for the Members of the Home-Makers Association, by Members of Senior Home Economics Class of the University.

Afternoon Session.

2:30—The Farm Home in Saving the Boy and Girl for the Country, Prof. P. P. Claxton, University of Tennessee.
3:00—How to Interest the Children in Plants, Dr. Ernest Shaw Reynolds, University of Tennessee.

Third Day, Thursday, May 18.

Morning Session.

9:30—Convenient Kitchens, Miss Louise C. Turner, Teacher of Domestic Science, Knoxville City Schools.
10:00—The Fireless Cooker, Mrs. Chas. O. Browder.
10:30—Food Laws and Home-Makers, Lucius P. Brown, State Pure Food and Drug Inspector, Nashville.
11:00—Election of Officers of the Tennessee Home-Makers' Conference Association.

THE PREPARATION OF A SEED BED.

SAM WARREN, (Special).

One of the greatest mistakes made by the farmers all over the country is the poor preparation of their land before planting the seed. This is one of, if not the most important, points connected with the study and practices of agriculture. It is a subject that many of our farmers seem to have little knowledge of, and many do not know or realize the vital importance of putting their fields in the very best possible condition before planting their seed.

It matters not what we intend planting, or what variety of crop we intend to raise, the seed bed should be well prepared in order that we may obtain the best results. Not only is the quantity and quality of the crop improved, but the amount of labor and expense saved in after cultivation of the crop is decreased. If the seed are sown in an ill-prepared soil we need not expect to obtain the best results. No matter how good the land may be, or how perfect a growing season is, if the ground is not properly prepared, one will not obtain the same results that he would have otherwise obtained.

If the ground is plowed when it is too dry, large clods that are difficult to break are turned up. Unless the farmer understands the importance of crushing these hard, dry masses of soil, he is not likely to take the time and worry that it requires to put the soil in the proper condition. So he plants his seed in this dry soil and if it does not rain, the seed will be backward in germinating and the weeds will spring up and take possession of the land. If there had been no weed seed in the land, and if the seed did not germinate, it is evident that there was not enough moisture in the soil to produce a crop. When the ground is plowed in such a dry condition the moisture already in the soil soon evaporates, and if there is a slight rain fall, the clods are hardened and the weeds are so much encouraged that the crop is soon choked out.

If the rain fall is in excess it will cause the clods to run together and form a crust over the land. In such a soil no plant can reach its proper growth. On the other hand, if the soil is plowed in a wet condition it is run together, and any attempt to work it down would soon bring about a physical change in the soil, causing both the air and water holding capacity to be decreased. Plants will not grow to perfection in such a prepared soil.

So in order to obtain the best results, one must work his soil when in the proper condition. Plow when land is moist and not wet. A good test used to determine whether the soil is too wet or not, is to take a handful of the freshly turned soil and press it in the hand. If it sticks together like putty it is too wet, but if it crumbles when you open the hand, that is a very good indication that it is in good working condition. If a fair season with plenty of rain is looked for, plow the land to a

good depth, 6 to 8 inches, so that it will catch and hold as much of the moisture as possible.

If a dry season is predicted, the soil should not be plowed so deep as it would otherwise be, for if it is, the pores of the soil are opened, and the moisture that is there is allowed to escape.

Another important point in plowing, is the turning up of the subsoil. If the subsoil is turned up and left on the top of the ground, it is to a certain extent injurious to the crop, but if it is turned up and mixed thoroughly with the top soil it is of a great benefit to the crop. The important factor in the preparation of a seed bed is to plow at a time when the soil will crumble easily, and harrow just as soon as possible. In some instances it has been profitable to disc the land just before plowing to break the crust and also disc it immediately after plowing. This breaks many of the lumps, both on and under the surface. A roller is useful in breaking small clods, so is a top drag harrow.

WHITE OAK AND WHITE PINE IN GERMAN FORESTS.

From "Baltimore Doings" for March, 1911.

A full day spent in the Spessart Mountains, a district of Bavaria known as the home of the best white oak on earth.

These oaks are up to 400 years old and command a stumpage price of $170 per thousand feet board measure, on an average. No wonder that the Bavarians plant oak wherever they cut oak. We have seen individual trees—numbers of them—having a stumpage value which exceeded $500. The texture of the timber seems to be particularly fine. The owners, (a number of family estates, the Bavarian Government and the Prussian Government) are in the habit of putting annually on the market a limited number of trees only, so as to maintain the price. In our country the restriction of the annual cut, in a desire to maintain the price, would be decried as a damnable trust. In Germany the same arrangement succeeds in preserving the forests and in supplying the country now and forever with oak timber.

Fascinating it is to see the embryo stage, the juvenile stage, the adult stage and the mature stage of the oak forest, all side by side.

The forests of Trippstadt were interesting to us particularly because here it is that white pine seeds were planted by a German officer, ingloriously returning from the Revolutionary War of America, some 130 years ago. Having failed to gather any laurels in his desire to defeat George Washington, he returned to Germany loaded with white pine cones. The result is stunning indeed: it consists of giant white pines, surrounded nowadays by a second growth of white pine up to thirty-five years old. It is particularly interesting to note that the second growth has been obtained by nature free of charge and without any help rendered by men other than fire protection.

As regards size and clearness of boles, the white pine seen at Trappstadt rivals the best we have ever seen in America.

EDITORIALS.

The U. T. Farmer is again in new hands. With this issue, the new staff takes charge and the staff of 1910 and 1911 retire. They have worked faithfully and with high hopes of the Farmer's future. They have kept very accurate account of the business of the publication, and in addition they have increased the circulation to no small extent.

The new staff comes with high aspirations to make the Farmer a larger and better paper than it has ever been. In order to do the publication justice, we must have the hearty co-operation of every agricultural student. We must pull together. The work use to fall upon the shoulders of a few students, but now our college has grown until it is several times as large as it was during the first year of the Farmer's existence. It was a great success then. It can be a greater success now, and the students of the Agricultural Club as a whole must make it what it is going to be in the future. The circulation can and should reach one thousand by the beginning of the fall session. Fellow-students, let us pull together and raise the circulation of the Farmer to that number.

The Agricultural students should strive to put before the people of the state a paper that will fully represent the work done in the Agricultural Department, both from an educational and experimental standpoint. This means a step toward the betterment of the agricultural methods of our fellow-farmer.

The student of the Agricultural College has an excellent opportunity to develop himself along many lines. He must not only be a successful husbandman, he must be a useful citizen, and he should be a leader in every effort for the betterment of his community and his state. To do this, he must have the power of expression. Writing maketh an exact man, and the U. T. Farmer offers every agricultural student of the University an opportunity to develop himself in this particular.

* * * *

It is often said that wild onions cannot be exterminated when they have a foothold in a field. With care the land can be cleaned of this pest.

The small field above the terraces on the Station Farm was badly damaged by wild onions in the fall of 1908. When the onions were about 16 inches high, the disc harrow was run over the field, cutting it up well. The field was then plowed deep and allowed to lay bare throughout the winter. In the spring of 1910, the soil was plowed only a few inches, in order to avoid turning up the onions from beneath. It was then seeded to a hoe crop or a crop of soy beans, and worked with much attention during the summer. The onions were about killed and the next season finished them outright.

The University of Tennessee has recently published some new bulletins, which should be of interest to the farmers of Tennessee. The following bulletins will be sent to any farmer of this state, free of charge, upon application to the Station: Fertility, Experiment in a Rotation of Cowpeas and Wheat. Insuring the Peach Crop; Relation of Temperature and Rainfall to Crop Systems and Production. The Relation of the Weather Service to the Farmers of Tennessee. The Relation of Stand to Soil fertility, and Experiments With Soils, Fertilizers, and Farm Crops.

* * * *

The Station has been running an experiment with crimson for several years, on 1-50 acre plats, in order to determine at what time the crop should be seeded for the best results. The following data has been collected regarding this subject: In 1908, five plats were seeded at the rate of 20 pounds per acre, as follows: August 1, September 14, September 30, and October 14, and they produced the following amounts of green hay: 506 pounds, 434 pounds, 103 pounds, 63 pounds, and 45 pounds, respectively. In 1909, the plats were seeded on May 1, June 1, July 1, August 1, and September 1. The May seeding died with blight on account of early seeding. The June and July plats produced 440 and 519 pounds. The August seeding died on account of the drought and was seeded on September 1. The production was 109 pounds of green hay. In 1910, they were seeded on August 15, September 15, October 15, and November 3. At this writing the plat seeded September 15 is much better than any other of the four. The November 3 seeding died on account of being too late.

From the above experiment it is found that getting a stand of clover depends as much upon the moisture content of the soil as any other one thing. The best stands have been gotten in July, August, September, depending upon the weather conditions.

* * * *

The Agricultural Club requests the farmers attending the Convention to make themselves at home in the club room on the second floor of Morrill Hall.

* * * *

Don't fail to visit the new Library Building during the Convention. It is a building that every one in the state may well be proud of.

* * * *

Be sure and bring your sons to the Convention with you. What can be of greater importance to farming than interesting the boys in agricultural questions?

PERSONALS.

Mr. Carl McAmis spent a week at his home in Greeneville a short time ago.

Mr. G. R. Worthington, '10, now has charge of the live stock interest at the Lespedega Stock Farm, Hickory Valley, Tenn.

Doctor Reynolds, of the Botany Department, and Professor Morgan attended the Conference for Education in the South, at Jacksonville, Fla., April 19th, 20th, and 21st.

Mr. W. C. Johnson has been at work with his father in the greenhouse business in Memphis for the last few weeks, but made a short visit to the "Hill" recently.

Mr. R. M. Murphy, '10, expresses himself as deriving much pleasure as well as benefit from his year's work at the University of Wisconsin, where he is doing post-graduate work.

Mr. C. A. Hutton spent several days in Nashville at the Overton Hall Farm testing cows for admission to the advanced registry.

Doctor Ayres and Professor Morgan left for Nashville, April 3rd, where they spent several days. Since then, Professor Morgan has made several trips through the state lecturing to the farmers.

Prof. C. H. Lane, former instructor in agronomy here, has gone to Washington, D. C., to engage in agricultural extension work.

Mr. L. R. Neal, of the class of '07, has been organizing corn clubs in Middle Tennessee. This is one of the very best ways to interest the boys on the farm, and it is encouraging to see the spread of this work in Tennessee.

Professor Keffer went to Jonesboro, April 3rd, to address the corn club at that place. He joined his Junior Horticulture Class the next day at Jefferson City, and together they went to Cranberry, N. C., to lay out an apple orchard for Mr. Howe, the proprietor of the Cranberry Iron Works. The trip proved one of much interest and much valuable experience was obtained.

Mr. W. M. Brown, of the short course of 1910, now teaching agriculture at the Hickson High School, Hickson, Tenn., expects to be with us soon.

Mr. W. M. Landess, '07, intends to go to farming near Fayetteville, Tenn. He declines a very fine position in the University of Georgia. Mr. Landess is another man who sees big things back on the farm.

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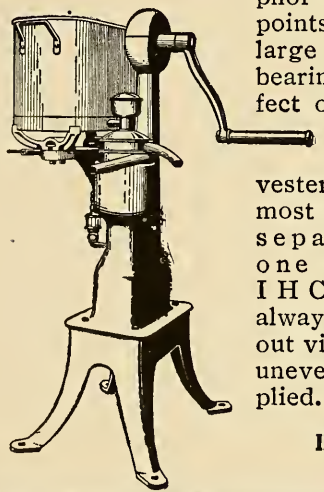

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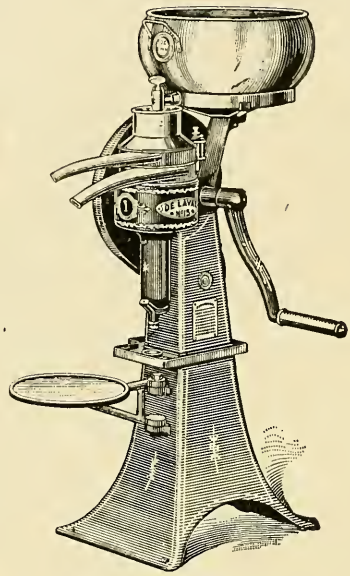

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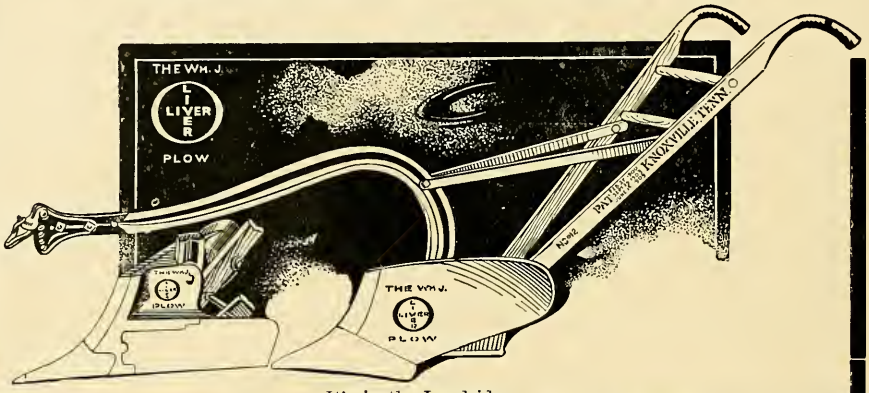

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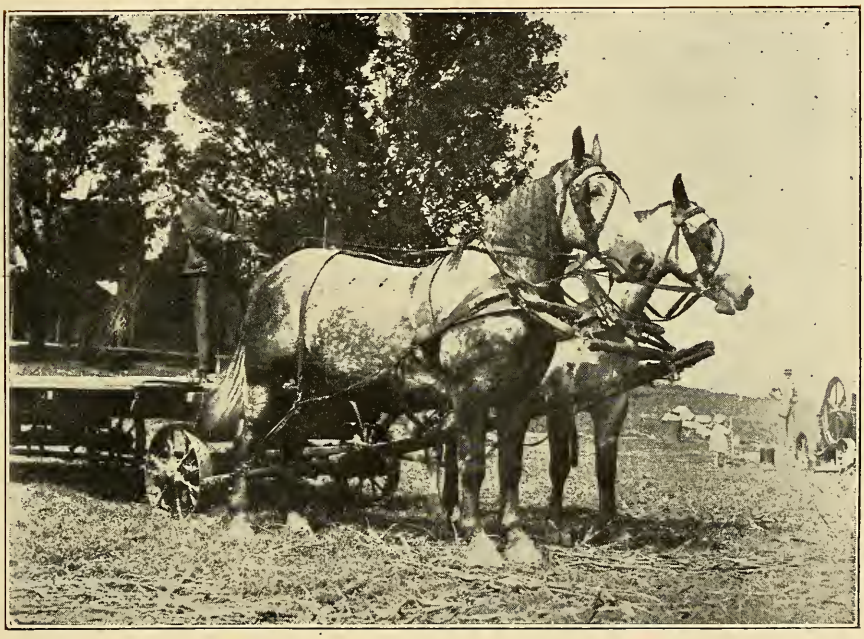

Percheron Mares, U. T. Station Farm.

Vol. V. JUNE, 1911 No. 9

Published Monthly by

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THE U. T. FARMER

Vol. 5. JUNE, 1911 No. 9

NOTES ON THE FRUIT FARM.

A. S. ADSMOND, '12.

The peach crop is almost a failure this year due to the severe weather which came in March. The Sneed has about one-fourth of a crop, but of other varieties, there is only a tree now and then that has any fruit. Most of the peach trees have been cut back very heavily, so as to form new wood. The peach produces its fruit on one year old wood. The cutting back will shorten the average height of the tree, hence bring the fruiting wood closer to the ground, making the fruit more easily gathered. These trees will be summer prunned with a view to produce fruit buds the first year and also to keep the tree with an open crown. These trees are 12 years old and have borne several heavy crops of fruit. They were prunned back in similar manner 4 years ago. The cut below shows the heavily prunned trees as they now stand. The smaller stump in the cut below is prunned back to about 11 inches of the crouch on the shortest limb and 15 inches on the longest limb. The face of the broadest cut is 4 inches in diameter. The longest stump is cut back to about 2

PEACH TREES THAT HAVE BEEN PRUNED BACK.

feet, 4 or 6 inches from the crouch. At this writing the longest new growth of these stumps is form 14 to 18 inches. With a proper season, according to previous observation, these shoots will reach a growth of 6 feet this season. The ends of these branches were all covered with a coat of paint to prevent decay of the limbs.

The small peach orchard set 8 x 9 feet, which was planted three years ago, was prunned back as shown in cut, and will be summer prunned with a view of getting a crop of peaches from them next season.

As to the apples there are a number of trees that have a fair setting of fruit. The mammoth Black Twig have scarcely any fruit. The Ingrams have a full crop. This variety usually blights badly, but so far the blight is scarcely noticable. This is probably due to the cool spring up till recently. The Ben Davids also have some trees that are fairly well laden with fruit.

The English Marello cherries have a fine setting of fruit. Otherwise the cherry crop is small. The plums were all killed by the heavy frost. The grape vineyard is in a fine condition and the prospects are good for a booming crop.

The tillage of the orchard and vineyard is at its best and two methods are being used: the sod mulch and cultivation method. The sod mulch method is used in a greater part of the apple orchard and consists of red top and alsike clover. There is an excellent stand. This is mowed down and left on the land two or three times each summer. The cultivation method is used in the peach orchard and vineyard. Early last fall it was all sown to rye as a cover crop during the winter to prevent washing, packing of the soil, and to take up plant food that would have leached out of the soil during the winter. About two weeks ago this rye was turned under and the land will now be disced and harrowed as often as necessary untill about the last of July. This keeps the weeds down and conserves the moisture.

The garden is not as good as usual on account of the wet weather this spring, which prevented its planting. And there has now been a three weeks dry spell, that has set it back severely. The peas are fairly good and have been mature enough for table use since the 10th of May. The potatoes are exceptionally good this year and have also an excellent stand. They have just been sprayed for the potato beetle, which is getting quite numerous. The spray used is 2 lbs. arsenate of lead, 2 lbs. quick lime to 50 gallons of water, applied with a barrel spray pump. The onion patch which produced about 350 bushels per acre of marketable onions last fall was planted with sets late in the fall and produced 700 dozen marketable onions bringing 10c a dozen. This same piece of land was seeded between the rows of the onion sets in February, and a good stand is assured.

The strawberry crop this season is short on account of the small quantity in cultivation and the dry weather of the last three weeks. A

year ago a greater part of the strawberry land was plowed up and sown to cow peas. This was turned under about the last of August, and sown to rye with an addition of lime and 300 lbs. of acid phosphate. The rye made an excellent growth and has now been plowed under. A part of the field has been prepared and planted to strawberries, one section getting an application of 875 lbs. bone meal per acre, another section 875 lbs. of acid phosphate and muriate of potash mixed, (400 lbs. acid phosphate to 100 lbs. potash). Two other sections have nitrate of soda added after planting. The remainder of the field will be sown to soy beans, and cut for hay. Then the field will be prepared and planted to strawberries this fall if the weather is suitable or early next spring. The rest of the land is plowed and prepared nicely for summer crops to be planted to soy beans, cow peas, etc., as soon as rain comes.

THE DRAFT HORSE FOR TENNESSEE.

By Judd Brooks, '12.

There has never been a time when there was a greater opportunity for the draft horse in Tennessee, than now. The time is at hand when farm power has gotten to be one of the greatest factors in our agriculture. The draft horse has done more to make possible the thorough tillage of the Northern and Western farms and to permit farming to be on a labor saving basis than any other animal of this Country. The farmers of Tennessee, can now rely upon the draft horse as a source of farm power and for the production of high priced mules.

At present, Tennessee, has only a few draft horses as compared with enormous numbers possessed by the Northern states. There is no reason why the draft horse should not thrive in Tennessee. It is true that Tennessee has many hills and mountains, but the draft horse can adapt himself to those conditions. Quebec, Canada, for example, possesses many mountains and the draft horse is found there. In the latter part of the seventeenth century, many French draft horses were imported into Canada. After a generation or so, the horse had adapted himself to the Canadian conditions, and became the important source of farm power of that country. The horse has won such a reputation there that it is now widely know as the French-Canadian horse.

The climate conditions of Tennessee, are ideal for the production of draft horses and high priced mules. The average temperature as stated in Tennessee Bulletin 87, is 59° Fahr; the average growing season in 202 days for the state. These climatic conditions give the Tennessee farmer an opportunity to grow two crops during one season. He can outstrip his Northern and Western brothers in this respect as they can only grow one crop a season. Pastures can be furnished the entire year for the brood mares. One crop of barley or red clover can be grown and marketed as

a money crop, then a nitrogenous catch crop that will cost very little and serve as feed for the stock during the short winters, can be grown.

It is true that there are many farmers who cannot see the advantage for using draft horses for farm work, but this number is rapidly decreasing. How can the farmer uphold the light-weight horse for farm or road work when at any time he may go on a pike or street and see light-weight teams of horses weighing from 800 to 900 pounds, tugging at loads that they can not pull straight along, but have to zigzag from one side of the road to the other in order to reach the summit of the hill? On the other hand, large teams of draft horses weighing from 1650 to 1800 pounds each are drawing their loads straight forwards. In many instances the large drâft horse can draw the load with more ease than the team of small Southern horses.

Plowing 18 inches deep with the deep tillage machine, hauling manure in a 100 bushel manure spreader; haying with six foot mowers, twelve foot rakes and hay elevators require horses of more than usual strength. Reapers and self-corn binders were never built for animals of light weight.

The University Station Farm has two Percheron mares that weigh from 1700 to 1800 pounds when in good condition. These mares do not consume very much more feed than do the light teams. They can do the work that four ordinary horses do. They can draw the cutaway disc harrow, the manure spreader, and the three horse plows with ease. They do not only do satisfactory work, but in addition, they produce fine colts that will weigh 1,200 pounds when a year of age. These mares are worth any man's $900.00.

Tennessee is noted for the good mules grown within her borders. At present, most of the mules are from light weight mares. This being the case, light-weight mules are very abundant. The light mule has the quality gotten from the typy mares that most mules do not have, but he cannot do the heavy work that his large brother can do. In the market quotation of almost any farm paper, the heavy draft horse or mule commands a price much higher than the light-weight ones. The market quotations of the April twenty-sixth, issue of the Breeders Gazette is as follows:

Desirable draft horses.....	1,700 pounds and over	$225 to $350
Light draft horses.....	1,550 to 1,650 pounds	175 to 225
Wagon horses	1,250 to 1,350 pounds	160 to 200
Southern Horses	900 to 1,000 pounds	100 to 165

St. Louis Mule market is as follows:-	Medium to Extra
14 hands	$ 75.00 to$145.00
14½ hands	92.50 to 157.00
15 hands	117.50 to 192.50
15½ hands	135.00 to 225.00
16 hands	150.00 to 275.00

From the above data the price per pound of the draft horse can be estimated. The 1,700 pound and over draft horse commands from 13.2 to 20.7 cents per pound. On the other hand, the light-weight Southern horse only commands for 11 1/9 to 16.5 cents per pound. The heavy mule from 15½ to 16 hands in height commands from $135.00 to $275.00 per head, while the light mule ranging from 14 to 15 hands in height commands from $72.00 to $157.00 per head. It can easily he seen that it is more profitable to grow the mule ranging from 15½ to 16 hands in height, commanding high prices, from heavy draft mares, than the small mules ranging from 14 to 15 hands in height, commanding a much lower price, from light Southern mares.

In almost every issue of the Breeder's Gazette, accounts are given of car loads of draft horses being shipped into the different sections of the United States for the purpose of raising high priced mules and for farm work. Only two months ago, Mr. H. B. Druyea of Hickory Valley, Tennessee, purchased on the Chicago market, twenty draft mares weighing on an average of 1,500 pounds each. Most of these mares were grade Percherons, a few show Clydesdale blood, and the others are grade Belgians. Individually they were the best that could possibly be secured after two weeks of hard work in the Chicago yards. Those mares were brought from zero weather in Chicago to a temperature of sixty-five or seventy degrees, and were put to doing all kinds of farm work and heavy hauling. They did fine. Mr. Druyea has bought a large fine jack and expects to raise high priced mules for the market as well as to get farm service from them. Mr. Druyea states in the March fifteenth, issue of the Breeder's Gazette that since he had commenced to plow deeper and use heavy machinery, light mules were of no service to him. It required a heavier mule to do the work. He has been purchasing high priced heavy mules from Missouri to draw this heavy machinery. He says that the big mule is necessary and that they come from the big draft mares; so he has purchased the above mentioned car load of draft mares to begin growing his own mules.

From the foregoing it can be sees that there is no reason why Tennessee, should not produce more draft horses and high priced mules. The climate conditions are favorable and the horse can adapt himself to the hilly conditions. And again the time has come when deep tillage is necessary and large horses and mules are required to do this tillage. To be of the greatest profit to the farmer the draft mare is recommended because she does not only work but she produces the desired high priced mule. We as farmers of Tennessee, should advocate the draft horse for the farms of the state; and every progressive farmer should by example hasten the time when farmers no longer leave their own state to purchase high class animals.

FEEDING THE PEOPLE.

By D. C. Parman, '11.

Agriculture bears very close relation to all other industrial activities of America. We are essentially an agricultural nation. Through the lack of training in systematic and economical methods of farm management the natural fertility of the American soils has been exhausted to an appreciable extent. Practically all of our lands have been put under cultivation that can be made profitable under the present systems of management. Our population is increasing rapidly, especially in the cities and men who have studied the question of supply and demand tell us that unless there is a change in our methods on the farm, we will, in a few years be unable to feed our people.

Agriculture is the digestive system of a great body. We may say that commerce is the circulatory system; manufacturing is the part in which assimilation and regeneration takes place; and the legislative and executive powers are the nervous system. One occupation can not exist without the other and as the systems of a body they bear very close symbiotic relation to each other. We know that a strong, healthy man may abuse his digestive system by improper care, and that in time his health is broken down by indigestion, then inactivity of the whole body follows. It is much the same way with the industrial activities of a nation. There is more truth in the little quotation, "A nation is just as strong as its agriculture" than most men surmise.

Agriculture is one of our greatest resources. The 1900 Census shows that twenty-five per cent of the wealth in continental United States was invested in agriculture; there was two and one-fourth times as much invested in agriculture as in manufacturing and about two times as much in agriculture as in steam railroads. Thirty-five per cent of the industrial population was engaged in agriculture; a little less than 26 per cent was engaged in manufacturing and about 6.5% was engaged in steam railways. Sixty and ninety-eight hundredths per cent of our domestic exports for 1900 were agricultural products, 35.30% was manufactured products.

There has been a gradual increase in the urban over the rural population of the continental United States. This increase was slight from 1790 to 1840. At this time it was accelerated by the development of manuing industries and by the invention of labor saving farm implements. In 1790, 3.4% of the total population was urban; in 1840, it was 8.5%. This shows a gain of about one per cent for each decade. Since 1840, there has been a consistent gain of more than 4% for each ten years, until in 1900, the urban population was 33.1% of the total. The increase in the New England States and in states that use labor saving machinery on the farm has been proportionally greater than in the other states. There has been an increase in farm products which have been grown and

harvested by machinery per capita, and a decrease in those which machinery could not be used. From 1840 to 1900, there has been an increase in manufactured exports of 21.5% and a decrease in agricultural exports of 11.9%. This is partly accounted for by the raw material of the farm being converted into manufactured products before it was exported.

With the development of the steam railway the center of production was moved westward from the older states. As soon as the railroad began to push into the fertile plains of the Mississippi Valley the buffalo was driven out by the cowboy and his herds. These were in time succeeded by the grain farmer, who today feeds the eastern manufacturer. In 1869, the first transcontinental railway was completed. At present we have seven of these lines besides numerous short lines and branches into all sections of the country. In 1893, the great Northern Road was completed to Seattle. This opened one of the greatest grain fields of the world to the oriental markets.

Transportation facilities tend to equalize supply and demand. They enable communities to tide over periods in which the supply of food is less than the demand. But a community or a nation must not exhaust its resources, for in such a case the community must perish. The little towns of the Great Bend wheat section of Kansas suffered severely during the hot wind years of the eighties, but transportation enabled these people to live through these years of want, and now they are the most prosperous people in the Union. It is entirely different in the case of the abandoned Eastern farm. The surface soil in which the plant food was stored has been washed away and they can never become profitable until something is done to hold this plant food which is being produced by the disintegration of the rock left bare.

Our yields have increased per capita but our available lands are all occupied. In the last fifty years our population has increased about seventy per cent. From these figures we see that something must be done to supply the nation for the next century. European nations see what we are facing and are on the lookout for a bread supply for the future. When we can no longer produce food enough for our people we have no place to import from as Europe had. We can not rely on our skilled manufacturing and on our mines. It is true that there is much undeveloped land in South America and in Africa, but most of these are under the control of Europe and we can expect little or nothing from them.

There need be no alarm of the United States facing want if we will only preserve our mineral plant food: potash, phosphate and calcium. Clark estimates that 2.5% of the earth's crust is potash and 3.44% is calcium. Phosphate is in such small amounts that he did not calculate it in the makeup of the earth. All arable soils contain some phosphate but it is one of the scarcest of the plant food elements, and is the element to which most all soils respond the most readily. We have an abundance

of phosphate in the natural deposits of the United States. We must preserve this supply by checking the exportation of the raw material as Germany has done with its potash.

Through the lack of general training, the farmers of America are allowing the water of the rainy seasons to carry away their soils instead of being stored in the soil for future use when the dry season comes on. Geologists estimate that the Mississippi carries 10.5 billion cubic feet of soil into the Gulf of Mexico annually. The most valuable food for plants is in the surface soil. When the rains come if the soil is not in condition to receive them, it collects on the surface and in torrents carries away this available food. These floods do not only carry away the plant food, but if the land at the source of a stream is not controlled, it will allow the floods to become so great as to do untold damage in the valleys in the course of the stream.

The control of soil water is a great factor in crop production. We have millions of acres of land in the United States in swamps and low wet places, which is unproductive or has been at one time. Much of this land has been made fertile by drainage. On the other hand, we have millions of acres in the arid regions which do not naturally receive enough water to produce a crop. Many acres of this land have been made productive by turning the streams, which have their origin in the natural reserviors of the snow-capped mountains or regions of heavier rainfall, over them. The irrigated lands are the most productive in the world. Two reasons may account for this: First, rains have not leached out the plant food elements which were in the natural rocks; second, the plants receive just the right amount of water at all stages of their growth. Irrigated lands receive about 48 inches of water per year. Many of the humid regions receive more than this in rainfall. From this we can see that it is not the amount of water, but the way in which it is controlled which causes the differences in yield.

More than 99% of man's food comes from the air, but the small amount of mineral matter is essential. We see that if so great a portion of our food comes from the air we must devise some way to gather it and fix it in form for food. We can take the nitrogen from the air through legumes; carbon and oxygen are taken from the air by plants directly and hydrogen is taken in by the plants in soil water. To produce more food for the people we must till the soil more effectively. We can only control the efficiency of the plants in giving them as near as possible the right amount of water and mineral food elements in right amounts and in available forms.

The curse of American agriculture of today is the present system of tenant farming and lack of training in farm management. We must adopt a system whereby every man tilling the soil will be interested in preserving the soil fertility and also in increasing the yields per acre. Since about all of our arable lands are under cultivation, we must increase

the yield per acre to keep our yields per capita in balance with the increase in population.

HUMUS.

By H. P. Ogden, '13.

The supply of humus is one of the most important factors to consider in all problems relating to the improvement or maintenance of soil fertility. It exerts the greatest influence, chemically and physically, of all the soil constituents. To this substance was due, in a large measure, the fertility of virgin soil, while the poverty of large areas of our poor soils is the result of its exhaustion. All tillage operations burn up humus, especially is this true in warm climates. This simple fact has much to do with poverty of our Southern soil, where corn or cotton has grown year after year, with no thought of maintaining humus.

Hence, this question of humus is of especial importance to Southern farmers. Systems of farming must be changed and new systems adopted which will remedy these troubles. Space forbids discussion of types of farming in relation to maintenance of humus. All that is attempted is to show what humus is and what it does.

Unfortunately, the term "humus" does not refer to any particular substance, as muriate of potash or nitrate of soda, but consists of a great number of organic compounds, many of which are very complicated and not well understood. It is the black or brown pulverent material resulting from a considerably more advanced stage of decay than is represented by leaf mould. It is not the final products of decay, but the intermediate products formed after decay has proceeded so far that the organic substance has lost its original structure.

The presence of humus in the soil produces certain effects, physically and chemically. Physically, it effects soil structure and its water holding capacity. Chemically, it is of importance as a source of plant food, and as an agent for rendering insoluble plant foods available to plants.

It improves soil structure by causing the minute particles of a soil mass to group themselves in such a way as to secure the greatest water holding capacity and best aeration. The question of structure is very important in the fine textured soil, since upon the structure depends their lightness and tilth. In good textured soil, the small particles collect in little flakes, with air spaces between, allowing air and water to move freely. Humus has the power to cause the particles to assume this arrangement. When humus is exhausted they fall apart and the particles run together and settle in a hard compact mass, which, when plowed, forms clods instead of crumbling. The best crops can never be grown on such soil.

In addition to the water holding capacity of soils with good structure,

is the moisture holding capacity of humus itself. Sand, without humus, can absorb and hold 25 per cent of its dry weight of water, clay about 60 per cent, while humus will hold 200 to 300 per cent. Too much stress cannot be layed upon the great importance of maintaining a constant supply of moisture within reach of plant roots. Almost any soil produces a fairly good crop in good seasons, but in dry seasons, soils poor in plant food and humus fail to produce satisfactory crops. As far as the total amount of rainfall is concerned, there is much more supplied than is needed to produce the most phenominal crops, but it is not properly distributed. What we need is a big sponge in the soil to catch the rains when they do fall and save the water until the plants need it. Humus furnishes this sponge. Of course, much water may be conserved by proper metheds of tillage, but none of these methods can attain their highest efficiency without the presence of humus in the soil.

Nor are the physical effects of humus all that deserve our attention. The chemical effects are none the less important.

In the first place, humus contains plant foods. The amounts contained are not large relatively, but in the aggregate, amounts to no little figure in a field well supplied with humus. Of course, this plant food cannot be considered as added to the soil—except in the case of nitrogen—since it was obtained from the soil originally, but it is of importance since the plant foods are in forms not readily leached from the soil, but quickly available to plants. In some soils, humus may continue to furnish plant foods for many years.

Secondly, humus not only contains plant foods, but it also converts insoluble substances to useful plant foods. Perhaps this is the most important property of humus. Anyway, it is of sufficient importance to justify its maintenance in the soil. The terms "available" and "unavailable" as applied to plant foods, are sometimes more a matter of convenience than exactness, since the availability depends largely upon its state of solution and this changes continually. As a matter of fact, the amount of plant food taken up by a single plant is not all soluble at one time, and this is a good thing, for if it were, all the plant food would have been dissolved and washed to the sea long ago. Nature has locked these plant foods where they would be kept safe until our time and for the ages to come. But she gave us the key to this vast storehouse of plant food. We unlock it by means of bacteria.

Nature has stored plant foods in two forms; as gases and as insoluble salts in the soil. Both forms are unavailable for the immediate use of all plants, except oxygen and carbon. There is only one plant food stored as a gas that the higher plants cannot utilize for food—nitrogen. Nitrogen must be taken into plants by the roots, hence the only available forms are those of soluble nitrogen salts. Many kinds of bacteria are able to take nitrogen from the air and combine with it other elements to form soluble salts and render it available as plant food. While

there are many kinds of bacteria which do this, all may be divided into two classes: Those which live upon roots of legumes and those which live upon humus.

We have been taught the value of legumes as gatherers of nitrogen, but we must not forget that there are other bacteria that gather nitrogen from the air other than those found on legume roots. Geologists tell us that rocks do not contain nitrogen and that many ages ago nitrogen occurred nowhere but in the air. To-day we find nitrogen in the soil, plants, animals and many articles of commerce. How was it obtained from the air? It was taken out by bacteria, but plants requiring nitrogen existed upon the earth for millions of years before legumes made their appearance. This shows that there were bacteria existing in the soil long before the time of legumes. These bacteria still exist, or forms similar to them, and their growth depends upon the presence of humus, since they must have food to furnish them with the energy necessary to gather nitrogen. In some of the acid sections of the country it has been found that after irrigating and growing crops for a few years, the soil became very rich in nitrate of soda. The phenomina can only be explained by assuming that the water and humus, added to the large amounts of alkaline salts, furnish the best conditions for the growth and work of these bacteria. Humus thus furnishes a home and nourishment for millions of bacteria, converting insoluble gaseous nitrogen into available nitrogenous plant foods.

It furnishes a home for many others as well, which liberate substances as waste products, which are able to dissolve mineral plant foods and unlock for the plant a continual supply of potassium, phosphorous, lime, etc.

The extent of the solvent actions of organic acids liberated by bacteria has never been estimated, but some idea of its magnitude is shown in the case of soils, resulting from limestone. One of the principal substances liberated by bacteria is carbonic acid, which is carried into the soil until it encounters the limestone, where it dissolves a small portion and carries it away in solution, leaving behind as residue the insoluble portions. Analysis shows that limestones contain 5-10 per cent insoluble matter, and it is this 5 or 10 per cent that forms our red limestone soils. That is, for every 5 tons of earth 95 tons of limestone was dissolved and for the few feet of soil, thousands of feet of rock were dissolved, and all this by products formed out of humus by bacteria.

A review of the more important points considered show what humus is and what it does in the soil. Even though we cannot define it exactly, we know that it is the substance resulting from decay of plant and animal material, and that it produces many beneficial effects upon the soil, physically and chemically. It does this by improving the structure and water holding capacity of soils; by furnishing a home and nourishment for bacteria and by causing the more rapid availability of insoluble plant food.

Humus is the life of the soil and no system of farming which does not recognize this fact can hope to maintain the fertility of our soils. Instead of raising corn, corn, corn, we must adopt systems which will have rotations providing for increasing the humus supply by growing grass, keeping live stock and turning under green manures. When we become humus farmers, we will be permanent farmers.

THE HOG AS A MONEY CROP.

G. E. Shelby, (Special).

When we come to consider the Animal Industry from a financial viewpoint, there is probably no other animal that gives so quick and profitable returns as the American Hog. And with present conditions, he promises to become the most profitable crop of the great cotton and corn growing states of the Mississippi Valley and of the Gulf Coast. This is especially true of the Southern portion of this section of the United States.

In all instances where only one crop has been grown year after year, as corn, tobacco and cotton have been grown in the South, we find the soils sooner or later depleted of their fertility. This method as practiced in the South has brought about a decrease in yield per acre, from 30 to 60%. With this decrease in yield and the superscarcity of labor, which prevents the increase of the average, coupled with the ravages of the Boll Weevil, the Southern farmers have been puzzled as to how he could maintain his standard of production and income.

The various Experiment Stations of the South have been studying this question for several years. At the present, about the best solution to the question is for the Southern farmer to engage in Animal Industry, and pork production seems to be the safest and most profitable branch of this Industry.

The conditions for profitable Swine Husbandry are almost ideal. The climate and soil which will best favor the production of any live stock are those in which the same kind of live stock is found wild. In his native state, the hog frequents those localities where vegetation is abundant. The climate is usually one of only moderate severity. The South with its mild and equable climate, coupled with the luxuriant vegetation which can be grown the year round, offers to the hog a habitat that is almost a Paradise.

There is hardly a place under the sun where you can grow more variegated and abundant crops than on some of our supposedly worn out cotton, corn and tobacco soils. It would be hard to find a Northern or Western grown crop that will not thrive in the South and produce an abundance of cheap food for the hog. In the Blue Grass regions of Kentucky, Tennessee and Missouri you find a pasture for hogs second to none. But in the cultivated grazing crops which can be grown anywhere

in the South such as Barley, Oats, Rye, Rape and all the legumes we have possibly more profitable grazing crops.

The trouble with the Southern farmer has been that he has always looked upon anything that resembled grass with disfavor. This feeling that he has had for all grazing lands has been due probably more than anything else to his failure in the Hog Industry. He has endeavored to produce pork on a corn yield of 12 to 25 bushels per acre, fed to pigs in a dry lot in competition with his Northern neighbor on a corn yield at from 50 to 100 bushels per acre. Consequently he has arrived at the conclusion that the hog as a money crop has no place on the Southern farm.

This conclusion, however, is wrong. Of course if he expects to go in the Hog Industry ignoring the cheap and abundant grazing crops which he can so easily produce and depending wholly upon an expensive corn crop fed in dry lots he is certainly going into an unprofitable business. But on the other hand if he will make use of the grazing crops which he can so cheaply produce depending on corn only as a supplement and brushing off feed, there is hardly a branch of farming that will return so large and quick net profits.

From experiments carried on by the different Experiment Stations while it has been shown that corn will produce a pound of gain cheaper than any other feed fed alone yet when feed as a supplement to much cheaper grown forage crops the cost can be reduced from one-half to two-thirds. It has been shown by experiments made by private individuals and Experiment Stations that the cost of producing 100 lbs. of pork fed on corn alone, with corn at the following prices per bushel was as follows:

Corn at .40	Pork cost $4.00 per cwt.
Corn at .50	Pork cost 5.00 per cwt.
Corn at .60	Pork cost 6.00 per cwt.
Corn at .70	Pork cost 7.00 per cwt.

At the Alabama Stations a number of experiments were made to determine the value of different forage crops and a bushel of corn when fed together to hogs. For Rape it was found that 100 lbs. of pork could be produced at $3.00 per cwt. and that one acre of this forage was equivalent in feeding value to 62 bushels of corn; and the corn fed to the hogs at 5 cents per pound was worth 80 cents per bushel after deducting all expenses for producing the Rape and rent for the land. This gain was made during the winter months when the average farm lands were lying idle. Thus the farmer is one crop ahead, equal to about 30 bushels of corn per acre. In a test at the Wisconsin Station after deducting rent and cost of Rape, it was found that corn, fed in connection with Rape, with hogs at 5 cents was worth 92 cents per bushel.

In the Experiment with cowpeas an acre was found to be worth in feeding value 37 bushels of corn. The corn fed in connection with the

cowpeas being worth 72 cents per bushel with hogs at 5 cents after the rent and all expenses had been deducted. The net profits on the one acre of cowpeas foraged by hogs was $26.20.

With Soy Beans it was found that 100 lbs. of gain could be produced for $2.74 when fed in connection with corn at 70 cents per bushel. While being fed alone this corn was realizing only 49 cents per bushel, but when fed in connection with the Soy Bean crop with hogs at 5 cents per pound it realized $2.21 per bushel after all expenses had been deducted.

From experiments carried on at the Arkansas Station with Peanuts as a forage crop for hogs the value of one acre was equivalent in feeding value to 40 bushels of corn per acre and corn fed in connection with it was worth $1.44 per bushel after all expenses had been deducted.

At the Missouri Station an experiment was conducted to determine the amount of pork that could be produced per acre with various forage and grain crops when hogged off. The prices of feeds fed in connection with all these crops were, corn 60 cents per bushel and oil meal 30 cents per ton. The value of gains made were rated at 6 cents per pound and all net profits are calculated after $10.00 per acre has been deducted for rent of land and cost of production.

The net profits on the acre of Blue Grass forage were $17.25 and the corn fed with it returned 66 cents per bushel.

The net profits for alfalfa forage was found to be worth $35.71 per acre and the corn fed in connection with it worth 95 cents per bushel.

The clover acre returned a net profit of $34.11. The corn fed in connection with it returned 98 cents per bushel.

The acre of rape, oats and clover forage returned a net profit of $23.64. The corn fed in connection with it returned 90 cents per bushel.

The Experiments in hogging off corn returned a net profit of $35.34 per acre.

As the result of these experiments with the price of corn and meat at their ratio when this experiment was made it was found that corn fed to hogs in connection with some forage crop could be marketed at from 35 to 75% higher than when fed alone. But at the present prices of meat and corn this profit would be materially increased.

In computing the net profits derived from forage crops hogged off, no account has been taken of the value of the fertilizing elements that are left well distributed on the land where crops formerly removed them. This is a very important factor in maintaining soil fertility and should not be overlooked especially in the South. Gray of the Alabama Station, says, "The farmer who grows leguminous crops and grazes them off with hogs has a fertilizer factory on his own farm." In testing this the Arkansas Station grazed hogs on soy beans, cowpeas and peanuts. The value of the increase of yield per acre in cotton was worth as follows: Soy beans $16.30 or an increase in value of 44.6 per cent. Peanuts $22.80 or an increase in value of 61.1 per cent.

The increase of yield in the case of soy beans and peanuts was of course, in part, due to the legumes but with the chufa which is not a legume the increase was due entirely to the grazing by the hogs.

Another important factor which we should not overlook is the wonderful saving of labor through the hog harvesting his own feed. The labor question is one of the greatest limiting factors of production on the Southern farm and with the development of a machine that will harvest our crops and at the same time convert them into a finished product we have taken a long step toward solving one of the most important economic questions of the farm.

From a study of the conditions for pork production in the South, I think we would be justified in drawing the following conclusion:

First. Inasmuch as green crops can be grown practically every month in the year and the brilliant prospects for the South as a corn producer, it is possible for the Southern farmer to produce pork cheaper than the Northern farmer. And with the same market right at our doors, that the Northern farmer has in the past so largely defended, we can certainly reap a much larger profit.

Second. It is the only practical and profitable way for us to restore the wasted fertility to our farms.

Third. It is the only way in which the Cotton and Tobacco planters can hope to liberate themselves from the Cotton and Tobacco Trusts. For without a supply of food of which pork is the largest and most expensive constituent the farmer cannot keep back such expensively produced crops from the ridiculously low prices which they are at times compelled to take.

ADVICE TO BEGINNERS IN THE POULTRY BUSINESS AND SOME OF THE MOST COMMON MISTAKES.

By W. M. Brown, (Special).

The opportunity for making a success of growing poultry in the South was never better. We need more men who will grow poultry,—not the scrub stock that we now see adorning the barnyards of so many Southern homes, but thoroughbred and better poultry that will demand the best prices, and will always find a ready market. We are buying millions of dollars worth of poultry products from our Northern brothers each year and having then shipped to us at fancy prices. Why not just reverse this? Let's grow all of the poultry that we need to consume and have some to ship out. We have an excellent opportunity of doing this; we have the soil, the climate, the feed, or we can grow it, the means, and the brains, so why not use them.

In the growing of poultry as in any other business there are many drawbacks, and it is principally of these obstacles and how to overcome them that we wish to speak of in this article. To start right in the

poultry business spells success in most instances. To start with poor methods, a breed not suited to the purpose; appliances and houses that do not meet the requirements, even though they be expensive, will usually result in failure. A great amount of time, money, and opportunity is lost every year in making mistakes and afterwards trying to rectify them, which means more loss of time and money. So let the beginner above everything else endeavor to start right.

In all of the operations of the farm there is much carelessness, but we believe that in no department there is so much carelessness and inattention as in the growing of poultry. This business is built of little duties and attentions to the daily need of the stock. Carelessness and inattention to these details and duties will work out failure.

When only a few chicks are to be grown and the range is spacious, the need of care will be less, and this number will somehow look out for themselves, but where the number of chickens goes into the hundreds and the range is limited it needs our constant attention and care to bring the chicks to proper maturity.

The feeding question is little thought of, but, nevertheless, very important. Chicks should be fed regularly; the ration should be properly compounded giving all the essential nutrients. A few days of improper feeding will knock off the entire profit that has been made on the stock during a whole year.

Nothing should be trusted to luck, we should know exactly what the birds demand, and supply it in a way that they may get the most out of it. They should be given constantly, grit, water, scraps, a succulent food, dust baths and other essentials for the comfort of the young stock.

Many breeders take care to bring up a good flock of birds and then leave them to the mercy of invading rodents and other vermin. We should go through every house at night, see that every bird is all right and comfortably situated; all doors and windows which have not been screened should be closed. Be sure to let the buildings be well ventilated.

Do not trust to the wire fence around the house; many of the intruders will dig under or gain entrance by different methods, so do everything in your power for prevention.

Another cause of much loss is the unbusinesslike methods applied. An account of all expenditures and incomes should be carefully kept. The breeder should know at all times just what his assets and liabilities are, and how much gain or loss. By knowing this he can plan to prevent this loss, or he finds out how to make the business pay him most. It may sound unreasonable, but there are many poultrymen who claim to be successful, who could not, if you should ask them, tell you what their feed cost them last month or last year; they could not tell how much they made last year,—in fact they know very little about the financial side of their business. Such a state of affairs should not exist; the poultryman should know as much about his business as the banker, merchant or manufacturer.

Many failures are due directly to the lack of foresight and preparation. No man should make the mistake of growing more birds than he has ample room for, and yet this mistake is a common cause of failure. It is an easy matter to take care of 500 or 600 small chicks on a few small lots, but as they grow to maturity these quarters will become entirely too small, filth will begin to accumulate, a few days or weeks of rainy weather will follow, and disease will soon come causing loss upon loss, and discouragement is usually next on program. To avoid all this the breeder must have enough foresight to make the proper plans, and prepare enough room, or about ten times as much when the fowls are grown as when they are a few weeks old.

In this case it will be well enough to count your chicks before they are hatched, and figure out beforehand how much room will be needed, and ample provisions made.

Another great mistake is made in not keeping constantly in touch with the current market prices for market poultry. By a careful study of market conditions, the poultryman, can plan to have his stock ready for the market when the highest prices can be obtained, or he may find out that there are other markets he can get besides the one near him.

Many times where the market advances, the grower holds his stock, thinking it will go still higher and while he is waiting the "bottom drops out of the market," and he loses heavily.

In the construction of new houses, pens, etc., the same lack of forethought is after shown. In building your houses, take time, study, plan, investigate, and find out what sort of house will give best results. Count the cost before you build, and build a house that can be run in the easiest possible way and save time and labor for the attendant.

Consider well its location, both for summer and winter. The chicks need plenty of shade during the summer, but they must have much sunshine during the winter to get best results.

In feeding, much is often lost, because we try to economize in the quantity and quality of food used to rear our poultry, as it is not a matter of how long it will take to feed out a bag or two of feed, but how quickly we can make them eat and digest it, for the quicker the right sort of food gets into the digestive system the quicker it will come out as growth upon the bird, and the quicker it can be exchanged for cash. We should never buy damaged grain or food for poultry because it may be a few cents cheaper. It is false economy.

The real economy in the feeding of poultry so as to obtain the best results in the shortest possible time for market poultry and for the production of eggs, is to buy the best grade of everything, and then to blend it in the right proportions so as to get out of it all the food value it contains.

Let the grower always take due precautions. It is as important in this business as in any other, and much loss is due to the failure to

make the proper plans and allowances. There are so many contingencies that can not be put down to take place at any given time that all we can do is to be ready for them when they come. Some morning it looks like rain, and precautions must be taken to get all the chicks under shelter as soon as the rain begins to fall, if they are let out at all that day. Some man might be left, ready to look after them immediately. More chickens are lost annually throughout this country on account of the people's neglect of taking the proper precaution against emergencies of all kinds than from any other source.

We have attempted to point out a few of the avenues of loss to the man who begins to raise poultry. These are a few, and there are many more which it will be well worth while to study carefully.

In conclusion let me say, if you wish to succeed in growing poultry, you must be in love with the work, give it close and careful attention, use the breeds best suited to your conditions, and use good business judgment in all of your operations.

A CORN FIELD OF THE UNIVERSITY STATION FARM.

By F. S. Chance, '14.

It may be of great interest to many farmers to know of the previous care and preparation of field or section VIII of the University Farm that is to be cultivated in corn this season. For a few years a double cropping system has been practiced on this field—the following data has been secured regarding the care of this soil:

The field is a clay loam, with clay subsoil, and is well supplied with humus. In September, 1908, the field was divided in a north and south half consisting of 4 acres each.

The north half was ploughed in the latter part of August, 1908, pulverized and disced, and seeded September 10, 1908, to Poal wheat at the rate of 1½ bushels to the acre. In June, 1909, the wheat was harvested for grain and yielded well. On June 20th, the soil was ploughed and rolled once, then, disced twice with a large single disc harrow. On July 18th, the yield was disced twice with a cutaway harrow and seeded July 21st, 1909, to Acme Soy Beans, at the rate of ½ bushel per acre, and millet at the rate of ½ bushel per acre. September the 20th, 1909, the Soy Beans and millet were cut for hay and put on cocks September 21st. Two days later the hay was stored in the barn. October 1st, the soil was ploughed and pulverized and seeded October 21st, 1909, to Sonoma oats, at the rate of 2 bushels per acre. March 18, 1910, our application of 75 lbs. of sodium nitrate per acre, was made. The crop was harvested about the first of June, 1910, producing a fair yield.

The south half of the field was ploughed in October, 1908, pulverized and seeded to oats and vetch at the rate of 2 bushels of oats and 15 lbs. of vetch per acre. It was cut for hay in June, 1909. July 15th, 1909,

the soil was ploughed, rolled and disced and seeded July 24th, to mammoth Yellow Soy Beans, and 17 days later it was sown to millet. Owing to the fact that the millet was sown late and that the Soy Beans grew rapidly, the millet was smothered out to a great extent. On September the 28th and 29th, the crop was cut and shocked on cocks, and a few days later the hay was removed to the barn. October 10th, the ground was ploughed, rolled and harrowed, and on the 20th, it was disced to conserve the moisture and seed. October 21st, to Union Barley at the rate of 80 lbs. per acre. March 18th, 1910, an application of 75 lbs. of sodium nitrate per acre, was made and the crop was harvested the first of June.

From June 20th to 25th, the entire field of 8 acres was ploughed, then, the field was harrowed with smoothing and cutaway harrows and seeded to Soy Beans and Sorghum alternating in rows, at the rate of 16½ lbs. of Beans and 4 lbs. of Sorghum per acre. On November 14th, this crop, which was very rank, was turned under with a deep tillage machine as green manure. On November 21st, the soil was pulverized and seeded to wheat and 15 lbs. vetch at the rate of 1 bushel wheat and 15 lbs. vetch per acre. During the winter, 6 acres of this field had an application of 92 loads of barn-yard manure. On April the 26th and 27th, 1911, the wheat and vetch was ploughed under as green manure, with walking plow. The Wakefield smoothing harrow, and pulverizer was then used upon this field. About March the first, an application of 2 tons ground limestone, 500 lbs. of acid phosphate and 50 lbs. muriate of potash and the field was later divided into four equal sections and seeded to the following varieties of corn: Cock's Prolific, Webb's Improved Watson, Read's Yellow Dent, and Hickory King.

EDITORIAL

The 38th annual meeting of the East Tennessee Farmers' Convention and Institute was held at the University, May 16, 17, and 18. The farmers over this part of the state came in great numbers. They were seeking a place where they might learn some of the most modern methods of farming. Many women were also in the assembly, they were in search of better methods of home making. The program was a good one,—men not only of the Tennessee Station but experts from the Northern and Eastern Agricultural Colleges delivered addresses. Much interest was manifested by the majority of the assembly here, and the men and women of the Convention have derived much benefit from this grand meeting. They should carry the messages gotten here to the farmers and wives who were not fortunate enough to come. The next year will soon pass away and the 39th annual meeting will be at hand. Let all the farmers of East Tennessee, as well as some from the state at large come to the meeting in 1912, and make it the largest in the history of the Convention.

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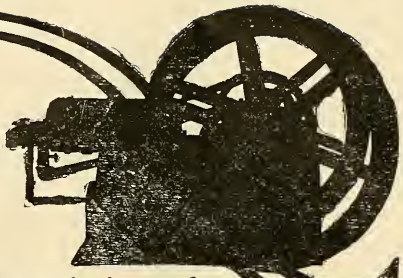

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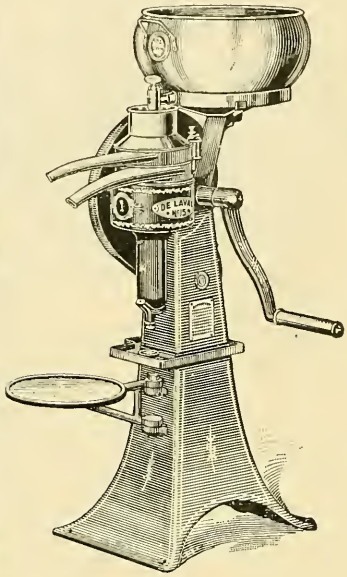

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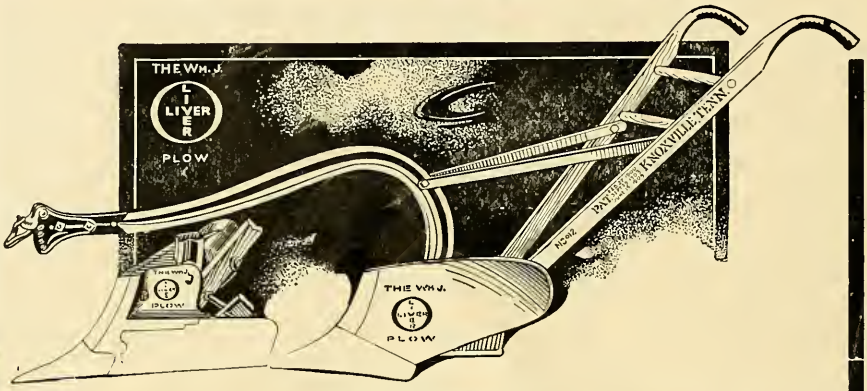

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